MARKING SCHEME

2006

CLASS XII

SCIENCE SUBJECTS

CENTRAL BOARD OF SECONDARY EDUCATION
DELHI

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Manuscript as such highlights the main value points and does not represent a complete ideal answer. Manuscript may vary from time to time and year to year.

PREFACE

CBSE as a pace setting national Board has constantly been striving to design its evaluation process in a manner that it is used as a powerful means of influencing the quality of teaching and learning in the classroom situation. Also, it has to be so designed that it provides constant feedback regarding the effectiveness of the course content, classroom processes and the growth of individual learners besides the appropriateness of evaluation procedures.

As a move in this direction, CBSE started the practice of publishing the Marking Schemes with twin objectives in mind-(i) making the system more transparent and at the same time, (ii) ensuring high degree of reliability in scoring procedure.

Who are the makers of answer scripts? How do they mark the answer scripts? How can it be ensured that marking is fair, objective and reliable? Questions of these types naturally arise in the minds of candidates appearing in the public examination. These questions are equally pertinent to the teachers who are not adequately exposed to the CBSE system of marking.

Answer Scripts marking is a specialised job. It is assigned to teachers-PGTs for Class XII and TGTs for Class X who are in direct touch with the subject and have a minimum of 3 years experience of teaching the subject at that level. Appointment of examiners is made in accordance with the well-defined norms. Markers examine scripts with the help of datailed guidelines called the 'Marking Schemes'.

It is this tool (Marking Scheme) alongwith the extensive supervisory checks and counter-checks through which CBSE tries to ensure objective and fair marking. The present publication is being brought out with a view to serving the following objectives :

(i)   To give an opportunity to the teachers and students to look into the Marking Schemes that were developed by the Board and supplied to the evaluators in 2006 main examination in some selected main subjects.

(ii) To receive feedback and suggestions from institutions/subject teachers on the utility and further improvement of Marking Schemes.

(iii) To encourage institutions to undertake similar exercise of developing marking schemes for classes other than those covered by the Board's examination with a view to increasing teachers' responsiveness to them as the essential tools of evaluation.

HOW TO USE

Teachers and the students preparing for Class XII examination of the Board constitute the primary interest-group of this publication. Marking Schemes of Question Papers in the subjects of English Core, Functional English, Mathematics, Physics, Chemistry, Biology, Bio-technology, Information Practices, Computer Science and Enginering Drawing administered in Delhi and Outside Delhi during the 2006 main examination have been included in this document. Some tips on their usage are given below :

(a)   To Teachers :

— Go through the syllabus and the weightage distribution for the subject carefully.

— Read the question paper to find out how far the question paper set subscribes to the prescribed design. Grade every question by difficulty level for students who have taken the main Board examination.

— Consult the 'Marking Scheme' for each question, with reference to steps into which answers and awards have been divided.

— Work out concrete suggestions for the Board.

(b)   To Students :

— Study each question carefully, comprehend them and write down the main points of the answer and note down their difficulties for clarification.

— Examine a question in conjunction with the Marking Scheme and find out the proximity of the answer to that suggested in the Marking Scheme.

— We will feel motivated if this publication is commented upon by practitioners in the context of its impact on their teaching learning strategies. Contribution of the experts and the officials of the Board in bringing out this document is gratefully acknowledged.

We urge the teachers to encourage their students to make use of this publication and at the same time to enrich us with their free and frank reactions.

M.C. SHARMA
CONTROLLER OF EXAMINATIONS

CONTENTS

Senior School Certificate Examination (XII)

Marking Scheme

LIST OF COORDINATORS/SUBJECT EXPERTS/REPRESENTATIVES OF THE REGIONS FOR UPDATION/FINALISATION OF THE MARKING SCHEME FOR SENIOR SCHOOL CERTIFICATE EXAMINATION, 2006

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ENGLISH (Core)

Time allowed : 3 hours   *Maximum Marks : 100*

General Instructions :

*(i)   The paper is divided into **three** sections : **A, B** and **C.** All the sections are compulsory.*

(ii)   Separate instructions are given with each section and question, wherever necessary. Read these instructions very carefully and follow them faithfully.

(iii) Do not exceed the prescribed word limit while answering the questions.

QUESTION PAPER CODE 1/1/1
SECTION A : READING

1.   Read the passage given below and answer the questions that follow :

1.   Today, India looks like it is on course to join the league of developed nations. It is beginning to establish a reputation not just as the technology nerve centre and back-office to the world, but also as its production centre. India's secularism and democracy serve as a role model to other developing countries. There is great pride in an India that easily integrates with a global economy, yet maintains a unique cultural identity.

2.   But what is breathtaking is India's youth. For despite being an ancient civilization that traces itself to the very dawn of human habitation, India is among the youngest countries in the world. More than half the country is under 25 years of age and more than a third is under 15 years of age.

3.   Brought up in the shadow of the rise of India's service industry boom, this group feels it can be at least as good if not better than anyone else in the world. This confidence has them demonstrating a great propensity to consume, throwing away ageing ideas of asceticism and thrift. Even those who do not have enough to consume today feel that they have the capability and opportunity to do so.

4.   The economic activity created by this combination of a growing labour pool and rising consumption demand is enough to propel India to double-digit economic growth for decades. One just has to look at the impact that the baby boomers in the US had over decades of economic activity, as measured by equity and housing prices. This opportunity also represents the greatest threat to India's future. If the youth of India are not properly educated and if there are not enough jobs created, India will have forever lost its opportunity. There are danger signs in abundance.

5. Fifty-three per cent of students in primary schools drop out, one-third of children in Class V cannot read, three quarters of Schools do not have a functioning toilet, female literacy is only 45 per cent and 80 million children in the age group of 6-14 do not even attend school.

6. India's IT and BPO industries are engines of job creation, but they still account for only 0.2 per cent of India's employment. The country has no choice but to dramatically industrialize and inflate its domestic economy. According to a forecast by the Boston Consulting Group, more than half of India's unemployed within the next decade could be its educated youth. We cannot allow that to happen.

7. India is stuck in a quagmire of labour laws that hinder employment growth, particularly in the manufacturing sector. Inflexible labour laws inhibit entrepreneurship, so it is quite ironic that laws ostensibly designed to protect labour actually discourage employment.

8. Employment creation needs an abundant supply of capital. Controls on foreign investment have resulted in China getting five times the foreign direct investment, or an advantage of $200 billion over the past five years. The growing interest in India by global private equity firms augurs well as they represent pools of patient and smart capital, but they too face many bureaucratic hurdles.

9. When it comes to domestic capital availability, budget deficits adding up to 10 per cent of the national GDP impede capital availability for investment and infrastructure.

10. Raising infrastructure spending,, coupled with rapid privatization, may not only create employment but also address the growing gaps in infrastructure. China has eight times the highway miles and has increased roads significantly in the past few years while India has only inched along. Freight costs at Indian ports are almost double the worldwide average, just to give two examples.

11. Moreover, like the Lilliputians that kept the giant Gulliver tied down, there are some 30,000 statutes in India, of which only a portion are even operational, and these keep the employment creation engine tied down. Since there are no sunset provisions in any laws, the regulatory morass only grows every year.

12. In the meantime, we as citizens of the world and descendants of India have to make a difference. We have to ensure that India and its youth attain that potential, both through our business pursuits and the support of

educational charities, on-the-ground proponents of participative democracy as well as other deserving organizations and initiatives.

13. I believe that hope can triumph and that this can be India's century - not one that will happen as surely as the sun will rise each day, but one that many willing hands will need to create together.

   (a) (i)   What makes the author think India is on the verge of joining the select band of developed nations ?   2

       (ii) Despite the fact that India is one of the oldest civilizations why does the author say it is young ?   1

       (iii) The author feels that if certain problems are not arrested, India would lose its opportunity. Why would India lose this opportunity ?   2

       (iv) What hinders employment growth ?   1

       (v) Who/what in the passage is referred to as the 'Lilliputians' ?   1

       (vi) How can we ensure that India and its youth attain their full potential?   2

   (b) Pick out words from the passage that mean :   3

       (i)   extremely exciting (para 2)

       (ii)   a period of sudden growth (para 3)

       (iii) another name for wealth (para 8)

2.   Read the passage given below :

Torrential rains and swollen rivers have caused chaos across central and eastern Europe, while a massive heat wave in southern Europe has helped reduce the Portuguese woodland to tinder. Tens of thousands of people face a massive relief operation as the extent of the devastation slowly becomes clear. The death toll continues to mount steadily across the continent. The latest estimate puts the number since mid August, 2005 at over 150. "Unfortunately, we are expecting the number of victims to rise by the hour," said Romanian interior minister Vasile Blaga.

Though the heat wave persists in Portugal and Spain, forest fires in Portugal have been brought under control. By August 26, 2005, the waters began to recede across Germany and the Czech Republic, the countries hardest hit by the floods. The situation also improved in Croatia, Austria, Bulgaria, Poland, Hungary and Slovenia. But some areas of Switzerland and Germany remained on alert.

Huge damages were reported from all over Europe. Thousands of people had to be evacuated from their homes. Many villages were abandoned in Portugal, while

helicopters were used in Switzerland and Austria to airlift people from flooded houses and landslides. The floods' worst impact was along the Danube, Morava and Elbe rivers and their tributaries. Dresden in Germany was one of the hardest hit.

Germany puts the damages at around US $14 billion, but the German state of Saxony alone puts its own costs at around US $16 billion. Austria quotes a clean up bill of US $2 billion, and the Czech Republic US $3 billion. But all these figures are speculative. What is disturbing is that relief operations appear stretched. In Germany, only US $200 per adult is currently available from both the EU and the government.

The reason behind the bedlam is the jet stream, high-speed winds usually found just below the tropopause, which drives the depressions and fronts that affect the weather. Usually found between 7,620 metres (m) and 13,716(m) altitude, it flows eastwards at speeds up to 200 m per hour around the Earth. It is formed when cold air from the Arctic meets warm air from the tropics. Because the jet stream fluctuates, its track makes huge differences to the weather. This year it positioned around Europe locking high pressure over southwest Europe which in its turn is responsible for creating intense drought in some parts and deluges of rain in other parts.

While many blame global warming for the disaster, some scientists are reluctant to draw a direct link. "We are linking these events to climate change... There are also other things happening: building up of the land, bad land use plans, bad fire prevention in the south... But all the factors together are more and more exacerbated by global warming," explains Martin Hiller, spokesperson for Worldwide Fund for Nature. Malcolm Haylock of the University of East Anglia, the UK, is more dithering: "You can say that due to the Earth getting warmer, there will be on an average more extreme events, but you can't attribute any specific event to climate change."

Despite growing consensus about global warming, it is hard to find long-term trends in rainfall that would have directly influenced the droughts, and floods Some experts believe the North Atlantic Oscillation climate system has caused a drift towards drier conditions in southern Europe and more rainfall in the north during winters; its effects during summers are not as clear.

(a)   On the basis of your reading of the above passage make notes on it using headings and sub-headings. Use recognizable abbreviations wherever necessary.   5

(b)   Write a summary of the above passage in 80 words using the notes made and also suggest a suitable title.   3

SECTION B : ADVANCED WRITING SKILLS

3. Water is precious and each one of us must stop wastage. Prepare a poster in not more man 50 words urging people *to* employ various methods of rain water harvesting in their colonies.   5

<div align="center">**OR**</div>

Your school is organizing a fete to collect funds for charity. Only school students are eligible to put up stalls. As Head boy/Head girl of the Meera International School, draft a notice in not more than 50 words to be put up announcing sale of stalls giving all other necessary details.

4. To promote healthy eating habits amongst School children, Vaibav Public School, Hastinapur, recently organized a 'Nutritious Food and Snacks Competition'. The competition was open to both parents and students. The participation was very encouraging. The famous nutrition expert, Dr. Shikha Sharma was the chief guest. As Archana/Anjum, the local student reporter for the Young India newspaper, write a report about this event in 100-125 words. Do not forget to give your report a catchy heading.   10

<div align="center">**OR**</div>

Recently you attended a Career Fair organized by the Australian High Commission in which various Australian colleges and Universities participated and gave information about their undergraduate and graduate programmes. You attended this fair. Write a detailed account of the fair in 100-125 words. You are Reshma/ Hamid.

5. You are Shilpa/Sameer living in Bangalore. You have just completed your studies and are looking for a job. While browsing through the Hindustan Times of 26.01.2006, you come across the following advertisement. Choose a post for which you think you are suitable. Send your application in response to this advertisement.   10

> *An upcoming food processing unit in Galogaon requires the following staff:*
>
> ***Food technologist:*** *2 yrs degree/diploma in food technology having 1-2 yrs lab experience.*
>
> ***Accountant:*** *B. Com. with minimum experience of 4-5 years in a manufacturing concern and conversant with sales tax taws.*
>
> ***Receptionist:*** *Young female candidates fluent in English with good communication skills and proficiency in computer/Net surfing with 2-3 years experience.*
>
> *Please send your detailed resume within seven days to Manager, Fancy Foods, Sector 68. Golagaon.*

OR

In its bid to educate people about the harmful effects of cigarette smoking, the Govt. of India has been taking serious steps to prevent it. A few years ago it ordered all cigarette manufacturing units to insert a statutory warning on cigarette packs. Now it is considering censorship of all cigarette smoking scenes in Indian cinema. Write a letter to the editor of a national daily giving your own views.

6. Last year's floods in Mumbai not only highlighted the inefficiency and indifference of the local administration but also brought out the indomitable spirit of the common man. It was a grand story of how people came to the rescue of people. Write an article in 150-200 words on how common man can realize his own powers and help rebuild a "New and Clean India" of which we can all be proud. Sign yourself as Victor/Hellen. 10

OR

You are Maneka/Manik. You strongly feel that the Indian Government is not taking adequate steps to promote tourism in India which could turn out to be one of the major revenue earning industries. Write an article in 150-200 words for a magazine giving your ideas on the steps the Indian Govt. could take to promote tourism aggressively.

SECTION C : LITERATURE

7. (a) Read the extract given below and answer the questions that follow:

Although it fall and die that night-
It was the plant and flower of Light.
In small proportions we just beauties see:
And in short measures life may perfect be.

(i) What does the word 'it' refer to ? Why does it die that night ? 2
(ii) What is the significance of the word "although" in the above lines ? 1
(iii) What message does the poem have for mankind through the above lines ? 1

OR

Freedom from the insult of dwelling in a puppet's world,
where movements are started through brainless wires,
repeated through mindless habits,
where figures wait with patience and obedience for the
master of the show,
to be stirred into a moment's mimicry of life.

(i) What, according to the poet, is the 'puppet's world' ?	1
(ii) What to his mind is insulting ?	1
(iii) Which two expressions indicate that this is a puppet's world ?	2

(b) Answer the following questions in 30-40 words each : 3×2=6

    (i) Sometimes circumstances compel a man to do something against his wishes. Bring out the truth of this statement by referring to the poem, 'The Man He Killed'.

    (ii) What, according to William Wordsworth, is.nature's 'holy plan' ? How has mankind shown its indifference towards it ?

    (iii) The poem, "Once Upon Time" is a lament for a bygone era. Illustrate the truth of this statement with examples from the poem.

8. Answer the following questions in 30-40 words each : 5×2=10

(a) Who was Bunbury ? Why was he so important to Algernon ?

(b) Bhai Parmanand says "... I for one, began to think that we had been forcibly pulled down from the steps leading to Heaven and made ready to enter the gates of Hell." Which, according to you, could be the steps to Heaven and gates of Hell ? Why does he say so ?

(c) What does Max Mueller mean by 'two very different' Indias ?

(d) Why does the author call the Gandhian movement for enlistment of women epochal and revolutionary ?

(e) Coming out of his office Parsons was glad to be alive. Why does he think so ?

9. Answer the following in 125-150 words : 10

Justify the title of the story, 'The Price of Flowers'.

<div align="center">

OR

</div>

Machines confer power and, therefore, they bring happiness. Taking cue from the lesson, 'Machines and the Emotions', give arguments in support of and against the statement.

10. Answer the following in 125-150 words :

How did the narrator of the story, 'The Face on the Wall", prove himself to be a master story teller ? How was the group gulled ? 7

OR

In his talk at the conference for parents of blind students, Dr. Stromer makes some very crucial points to make them understand that even handicapped people can live normal and happy lives. What arguments and examples does he give to support his belief ?

11. Answer the following in 30-40 words each :   4×2=8

    (i)   Why was Baldwin surprised when Marshall offered him a position in the Third National ?

    (ii) Mrs. Wang knew that a war was going on between the Chinese and the Japanese but to her it was not real. Why ?

    (iii) Why does Gandhi feel that he could not do full justice to all the young boys and girls at the farm ?

    (iv) In order to be effective vanguards of the nation what attributes, according to Dr. Karan Singh, should the young men and women of India be equipped with ?

<div align="center">

QUESTION PAPER CODE 1/1

SECTION A : READING

</div>

1. Read the passage given below and answer the questions that follow :

   1   Today, India looks like it is on course to join the league of developed nations. It is beginning to establish a reputation not just as the technology nerve centre and back-office to the world, but also as its production centre. India's secularism and democracy serve as a role model to other developing countries. There is great pride in an India that easily integrates with a global economy, yet maintains a unique cultural identity.

   2   But what is breathtaking is India's youth. For despite being an ancient civilization that traces itself to the very dawn of human habitation, India is among the youngest countries in the world. More than half the country is under 25 years of age and more than a third is under 15 years of age.

   3   Brought up in the shadow of the rise of India's service industry boom, this group feels it can be at least as good, if not better, than anyone else in the world. This confidence has them demonstrating a great propensity to consume, throwing away ageing ideas of asceticism and thrift. Even those who do not have enough to consume today feel that they have the capability and opportunity to do so.

4   The economic activity created by this combination of a growing labour pool and rising consumption demand is enough to propel India to double-digit economic growth for decades. One just has to look at the impact that the baby boomers in the US had over decades of economic activity, as measured by equity and housing prices. This opportunity also represents the greatest threat to India's future. If the youth of India are not properly educated and if there are not enough jobs created, India will have forever lost its opportunity. There are danger signs in abundance.

5   Fifty-three per cent of students in primary schools drop out, one-third of children in Class V cannot read; three quarters of schools do not have a functioning toilet, female literacy is only 45 per cent and 80 million children in the age group of 6 - 14 do not even attend school.

6   India's IT and BPO industries are engines of job creation, but they still account for only 0·2 per cent of India's employment. The country has no choice but to dramatically industrialize and inflate its domestic economy. According to a forecast by the Boston Consulting Group, more than half of India's unemployed within the next decade could be its educated youth. We cannot allow that to happen.

7   India is stuck in a quagmire of labour laws that hinder employment growth, particularly in the manufacturing sector. Inflexible labour laws inhibit entrepreneurship, so it is quite ironic that laws ostensibly designed to protect labour actually discourage employment.

8   Employment creation needs an abundant supply of capital. Controls on foreign investment have resulted in China getting five times the foreign direct investment, or an advantage of $200 billion over the past five years. The growing interest in India by global private equity firms augurs well as they represent pools of patient and smart capital, but they too face many bureaucratic hurdles.

9   When it comes to domestic capital availability, budget deficits adding up to 10 per cent of the national GDP impede capital availability for investment and infrastructure.

10 Raising infrastructure spending, coupled with rapid privatization, may not only create employment but also address the growing gaps in infrastructure. China has eight times the highway miles and has increased roads significantly in the past few years while India has only inched along. Freight costs at Indian ports are almost double the worldwide average, just to give two examples.

11 Moreover, like the Lilliputians that kept the giant Gulliver tied down, there are some 30,000 statutes in India, of which only a portion are even operational, and these keep the employment creation engine tied down. Since there are no sunset provisions in any laws, the regulatory morass only grows every year.

12 In the meantime, we as citizens of the world and descendants of India have to make a difference. We have to ensure that India and its youth attain that potential, both through our business pursuits and the support of educational charities, on-the-ground proponents of participative democracy as well as other deserving organizations and initiatives.

13 I believe that hope can triumph and that this can be India's century — not one that will happen as surely as the sun will rise each day, but one that many willing hands will need to create together.

   (a) (i)   What makes the author think India is on the verge of joining the select band of developed nations ?   2

        (ii)   Despite the fact that India is one of the oldest civilizations why does the author say it is young ?   1

        (iii) The author feels that if certain problems are not arrested, India would lose its opportunity. Why would India lose this opportunity ?   2

        (iv) What hinders employment growth ?   1

        (v)   Who/what in the passage is referred to as the 'Lilliputians' ?   1

        (vi) How can we ensure that India and its youth attain their full potential ?   2

   (b) Pick out words from the passage that mean :   3
        (i)   extremely exciting (para 2)
        (ii)   a period of sudden growth (para 3)
        (iii) another name for wealth (para 8)

2.   Read the passage given below and answer the questions that follow :

Torrential rains and swollen rivers have caused chaos across central and eastern Europe, while a massive heat wave in southern Europe has helped reduce the Portuguese woodland to tinder. Tens of thousands of people face a massive relief operation as the extent of the devastation slowly becomes clear. The death toll continues to mount steadily across the continent. The latest estimate puts the number since mid August, 2005 at over 150. "Unfortunately, we are expecting the number of victims to rise by the hour," said Romanian interior minister Vasile Blaga.

Though the heat wave persists in Portugal and Spain, forest fires in Portugal have been brought under control. By August 26, 2005, the waters began to recede across Germany and the Czech Republic, the countries hardest hit by the floods. The situation also improved in Croatia, Austria, Bulgaria, Poland, Hungary and Slovenia. But some areas of Switzerland and Germany remained on alert.

Huge damages were reported from all over Europe. Thousands of people had to be evacuated from their homes. Many villages were abandoned in Portugal, while helicopters were used in Switzerland and Austria to airlift people from flooded houses and landslides. The floods' worst impact was along the Danube, Morava and Elbe rivers and their tributaries. Dresden in Germany was one of the hardest hit.

Germany puts the damages at around US $14 billion, but the German state of Saxony alone puts its own costs at around US $16 billion. Austria quotes a clean up bill of US $2 billion, and the Czech Republic US $3 billion. But all these figures are speculative. What is disturbing is that relief operations appear stretched. In Germany, only US $200 per adult is currently available from both the EU and the government.

The reason behind the bedlam is the jet stream, high-speed winds usually found just below the tropopause, which drives the depressions and fronts that affect the weather. Usually found between 7,620 metres (m) and 13,716 metres (m) altitude, it flows eastwards at speeds up to 200 m per hour around the Earth. It is formed when cold air from the Arctic meets warm air from the tropics. Because the jet stream fluctuates, its track makes huge differences to the weather. This year it positioned around Europe locking high pressure over southwest Europe which in its turn is responsible for creating intense drought in some parts and deluges of rain in other parts.

While many blame global warming for the disaster, some scientists are reluctant to draw a direct link. "We are linking these events to climate change... There are also other things happening : building up of the land, bad land use plans, bad fire prevention in the south... But all the factors together are more and more exacerbated by global warming," explains Martin Hiller, spokesperson for Worldwide Fund for Nature. Malcolm Haylock of the University of East Anglia, the UK, is more dithering : "You can say that due to the Earth getting warmer, there will be on an average more extreme events, but you can't attribute any specific event to climate change."

Despite growing consensus about global warming, it is hard to find long-term trends in rainfall that would have directly influenced the droughts and floods. Some experts believe the North Atlantic Oscillation climate system has caused a drift towards drier conditions in southern Europe and more rainfall in the north during winters; its effects during summers are not as clear.

(a) On the basis of your reading of the above passage make notes on it using headings and sub-headings. Use recognizable abbreviations, wherever necessary.   5

(b) Write a summary of the above passage in 80 words using the notes made and also suggest a suitable title.   3

SECTION B : ADVANCED WRITING SKILLS

3. You plan to sell your old car. Draft a suitable advertisement in not more than 50 words to be inserted in a reputed national daily giving all necessary details of the car. 5

OR

Repeated earthquakes in India and elsewhere have resulted in unprecedented damage and destruction to both life and property. Educating people on the precautions to be taken is the need of the hour. Prepare a poster, in not more than 50 words, for creating this awareness.

4. You are Seetha / Surya living in Bangalore. You and your friends are planning a week long holiday. You come across the following advertisement. Select a destination of your choice. Write a letter making necessary enquiries from the tour operator before you make your final decision. 10

> ### This winter fill your holidays with endless masti and thrill
>
> *We offer exciting domestic and international holiday packages for individuals as well as groups.*
>
> *You decide and leave the rest to us.*
>
> 1. *Exotic Malaysia with Singapore and Star Cruise*
>   *10   nights/11 days*
>   *Rs. 54,000/-*
>
> 2. *Magical Singapore*
>   *5 nights/6 days*
>   *Rs. 14,999/-*
>
> 3. *Bangkok, Pattaya + Kul + Genting + Singapore*
>   *11   days*
>   *Rs. 32,999/-*
>
> 4. *Australia (Sydney, Coral Islands and CNS)*
>   *7 nights /8 days*
>   *Rs. 67,000/-*
>
> 5. *Best of Nepal*
>   *5 nights in a 5 star Hotel*
>   *Rs. 7,999/-*
>
> 6. *Exotic Goa*
>   *3 nights /4 days*
>   *Rs. 3,333/-*
>
> *For more details write to us or visit our website*
> *www.sewanathholidays.com*
> *Or write to us at :*
> *Sewa Nath Worldwide Holidays, 123-A, Kailash Building, Goverdhan Road, City Centre,*
> *Malegaon.*

OR

A leading news channel recently gave a live coverage of some young slum dwellers being beaten up mercilessly by the police for crimes not committed by them. Such atrocities shake the very faith of people. Write a letter to the Commissioner of Police urging him to adopt effective measures to curb such brutality against innocent people. You are Nita/Nitesh, a resident of Guwahati.

5. There were many vacant spaces in your colony which were lying unattended and uncared for. You and your friends decided to beautify and develop those areas into green parks or playgrounds for the benefit of all. With practically no money but lots of enthusiasm of the children of the colony, your project became a roaring success. It has now even caught media attention. You have been approached by a local newspaper to share your success story. Write a brief report in 100 - 125 words on how you organized the entire project. You are Neha / Nitin, a resident of Chandigarh.   10

OR

In order to promote book reading habit amongst school children, your school organized a 'Book Week'. During this week a number of exciting activities including interaction sessions with eminent authors took place. As Head Boy / Head Girl of the school you were actively involved in making all the arrangements. Write a report in 100 - 125 words. You are Manju / Mihir, a resident of Chennai.

6. Indian TV is doing a great service to the general public. Write an article giving your views on the above topic in 150-200 words for a leading magazine. You are Arth/ Arti, a citizen of Patna.   10

OR

A recent survey showed that there are still many communities in India which do not welcome the birth of a girl child. Can a country which does not give equal rights to all its citizens ever dream of becoming great ? Write an article in 150 - 200 words giving your views on the above subject and the steps we should take to solve this problem. You are Simran / Yusuf, a citizen of Hyderabad.

SECTION C : LITERATURE

7. (a) Read the extract given below and answer the questions that follow :   4

> "Had he and I but met
> By some old ancient inn,
> We should have sat us down to wet
> Right many a nipperkin !"

(i) Who are the two characters in the above lines referred to as 'he' and 'I' ? 1

(ii) What is the significance of the line, 'Had he and I but met ...' ? 2

(iii) What does 'a nipperkin' mean ? 1

OR

One day there fell in great Benares' temple-court
A wondrous plate of gold, whereon these words were writ;
"To him who loveth best, a gift from Heaven."

(i) Where did the plate of gold fall ? 1

(ii) What was written on it ? 1

(iii) What message does the poet give through this poem ? 2

(b) Answer the following questions in 30 - 40 words each : 3×2=6

(i) What, according to Tagore, has 'the burden of ages' done to our motherland ?

(ii) Why does Ben Jonson call the lily a flower of light ?

(iii) Wordsworth's heart was filled with wonder and sadness at the same time when he was reclining under a tree. What made him think so ?

8. Answer the following questions in 30-40 words each : 5×2=10

(a) As she was going out she asked the cashier in a low voice, "Is that gentleman an Indian ?" Why did Maggie ask this question ?

(b) How do machines deprive us of two important ingredients of happiness ?

(c) The Brahmo Samaj movement for emancipation of women has been described as a false dawn. Why ?

(d) What is Mueller's view about the study of Sanskrit ?

(e) What objection did Lady Bracknell have in giving her consent to Gwendolen's wedding with Mr. Worthing ?

9. Answer the following in 125 - 150 words : 10

A confinement in Andaman Islands was worse than a death sentence. Explain.

OR

There is light at the end of the tunnel but only for those who see it. Bring out the relevance of this statement by taking examples from the story, 'A Man Who Had No Eyes'.

10. Answer the following in 125 - 150 words :   7

The writer says that truth is vastly stranger than fiction. Do you agree ? Explain with reference to the story, 'The Face on the Wall'.

OR

Mrs. Wang wins our sympathy and admiration through her wisdom and simplicity. Explain the truth of this statement with examples from the story, 'The Old Demon'.

11. Answer the following in 30 - 40 words each :   4×2=8

(i)   "Each one of us misses out on some success or happiness", says Dr. Stromer. What is the point he wants to make ?

(ii)   At one point in the play, Baldwin says, '...never thought this day would come'. What is he referring to ?

(iii) The winner of the bet eventually did not collect his bet money. Why ?

(iv) When the glass kept near the wall of the compartment was vibrating, Barin became almost paralyzed with fear. Why ?

Marking Scheme—English Core

General Instructions :

1. Answer scripts should not be given to the evaluators for evaluation until and unless the given Marking Scheme has been thoroughly discussed with them in group or individually on the first day of their starting evaluation.

2. The Head-Examiners have to go through the first five answer-scripts evaluated by each evaluator to ensure that the evaluation has been carried out as per the Marking Scheme only. The remaining answer scripts meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.

3. Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration - Marking Scheme is the only guideline.

4. The Marking Scheme carries only suggested value points for the answers. These are only guidelines and do not constitute the complete answer.

5. If a question has parts, please award marks on the right hand side for each part. Marks awarded for different parts of the question should then be totalled up and written out in the left hand margin and circled.

6. If a question does not have any parts, marks must be awarded on the left-hand margin.

7. Where marks are allotted separately for content and expression as per the Marking Scheme, they have to be reflected separately and then totalled. This is a mandatory requirement.

8. A slash (/) in the marking scheme indicates alternative answers. If a student writes an answer which is not given in the Marking Scheme but which is equally acceptable, marks should be awarded only in consultation with the Head-Examiner.

9. If a child has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out.

10. Q1 under Section A (Reading skills) and Q7 (a) under Section C (Literature) questions have been designed to test a student's understanding and his ability to interpret, evaluate and respond to the given passage. In other words only the reading and comprehension abilities are to be tested. As such, content assumes more importance than expression in the answers to these questions. Therefore students should not be unduly penalised for poor expression and faulty spelling, as long as the answer clearly reveals understanding of the passage on the part of the examinee.

11. However, where questions have been designed to test the writing skills of students, expression (grammatical accuracy, appropriate vocabulary and style, spellings, organization and presentation of relevant matter in a coherent and logical way) is important.

12. Wherever the word limit is given, no deduction of marks is to be made if the word limit has been exceeded upto 25%. However, beyond this permitted limit, marks are to be deducted as follows:

    Penalty for exceeding the word limit

    For a 50 word answer:
    Above 60 - deduct ½ mark

    For a 100 word answer:
    125 to 150 words - deduct ½ mark
    Above 150 words - deduct 1 mark

    For a 125 word answer:
    150 to 175 words - deduct ½ mark
    Above 175 words - deduct 1 mark

    For a 150 word answer:
    175 to 200 words - deduct ½ mark
    Above 200 words - deduct 1 mark

    For 200 word answers:
    225 to 250 words - deduct ½ mark
    Above 250 words - deduct 1 mark

    However, no marks should be deducted in respect of short answer type questions (under Q7, 8 & 11) if the answer does not exceed 60 words. In case it exceeds 60 words, ½ mark may be deducted.

13. If a student, in response to a short-answer-type question, writes a single word answer which constitutes the core of the answer, it may be accepted and awarded full marks.

14. If a student literally lifts a portion of the given passage as an answer to a question, no mark(s) to be deducted for this so long as it is relevant and indicative of the desired understanding on the part of the student, especially in questions under Q1 and Q7.

15. A full scale of marks - 0 to 100 - has to be used. Please do not hesitate to award full marks, if the answer deserves it.

EXPECTED ANSWERS/VALUE POINTS

SECTION A : READING

1. COMPREHENSION PASSAGE

(a) NOTE: No marks should be deducted for mistakes of grammar, spellings, or word limit. Full marks may be awarded if the student has been able to identify core ideas.

(i) – reputed as the technology nerve centre
– back office to world
– production centre   (any two)
– unique cultural identity / secularism / democracy / role model
        (if only the second part has been done 1 mark)   1+1=2 marks

(ii) – more than half the country below 25 years of age / more than one third under 15 yrs of age / majority of population young   1 mark

(iii) – if the youth are not properly educated
– if enough jobs are not created   1+1 = 2 mark

(iv) – high drop out percentage rate
– 80 million children in the age group 6-14 do not attend school
– slow industrialization
– slack domestic economy
– intricate / inflexible labour laws
– lack of capital
– control on foreign investment
– bureaucratic hurdles / red-tapism
        (any one)   1 mark

(v) – the 30,000 outdated statutes / restrictive laws / too many laws   1 mark

(vi) ensure each child is educated / raise infrastructure spending coupled with rapid privatization / relax labour laws / create employment opportunities for the educated youth / understand the aspirations and urgency of its youth / participate in democracy / take advantage of economic reforms / awaken to the fact that they can wield immense political power / business pursuits / educational charities / inviting more foreign direct investments
        (any two)   2 marks

(b) (i) breathtaking   1 mark
(ii) boom   1 mark
(iii) capital   1 mark

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2. Note:

If the student has attempted only summary or notes, due credit should be given.

1 mark for title be given if the student has written the title in Q2(a) or Q2(b) part

Min. 3 main headings and 3 sub headings for content

The notes provided below are only guidelines. Any other title, main points and sub-points should be accepted if they are indicative of the student's understanding of the given passage and the notes include the main points, with suitable and recognizable abbreviations. Complete sentences should not be accepted as notes. If a candidate writes complete sentences, deduct ½ mark from the total.

Numbering of points can be indicated in different ways and these should be accepted as long as a consistent pattern is followed.

(a) **NOTE MAKING**

Distribution of Marks

Abbreviations / Symbols (with /without key) — any four	1 mark
Title	1 mark
Content (minimum 3 sub headings with proper indentation and notes)	3 marks

Suggested Notes

Title: Vagaries of Weather / Nature's Fury / Global Warming / Climate
　　　Change / any other suitable title

1. Massive heat wave, chaos across Cen. East. Europe
    1.1　1000s. face massive relief oprn.
    1.2　death toll mounting
    1.3　forest fire under control in Portugal
    1.4　situn. imprvd. in some countries

2. Damages
    2.1　1000s. evacuated
    2.2　many villages abandnd.
    2.3　flooded houses & landslides
    2.4　Germany worst hit

3. Reasons behind the bedlam
    3.1　jet stream, high speed winds
    3.2　global warming
    3.3　other factors also present
    3.4　climatic changes due to N A O

(b) **Summary**

The summary should include all the important points given in the notes.

Content:	2 marks
Expression	1 mark

SECTION B : (ADVANCED WRITING SKILLS)

3. NB : The answer to Q3 – Poster and Notice may be accepted with or without a box. However in Poster credit should be given for creativity.

POSTER

Content	3 marks
Expression	2 marks

Suggested Value Points

– water is precious
– save water
– harvest rain water
– improve water table
– do not wash cars / homes (use mops instead)
– any other relevant slogan or value point

OR

NOTICE (SALE OF STALLS)

Format   1 mark

The format should include: NOTICE / TITLE, DATE, and WRITER'S NAME WITH DESIGNATION. The candidate should not be penalized if he has used capital letters for writing a notice within or without a box.

Content	2 marks
Expression	2 marks

Suggested value points:

– only school students eligible to put up stalls
– eligibility classes 9-12
– only food and games stalls
– on first come first serve basis
– sale proceeds for charity
– last date for applying
– whom to contact

4. **REPORT WRITING**

Format	1 mark

Title and reporter's name,(date and place - optional)

Content	4 marks
Expression	5 marks

Grammatical accuracy, appropriate words and spellings [2½]

Coherence and relevance of ideas and style   [2½]

(NUTRITIOUS FOOD AND SNACKS COMPETITION/ any other relevant heading)

Suggested Value Points

– what, when, where the programme was organised

– dignitaries / guests present

– highlights of the programme

– response and success of the programme

– prizes / awards given

– any other relevant details

<div align="center">OR</div>

(CAREER FAIR)

Suggested Value Points

– what, when, where, by whom was the event organized

– highlights of the programme

– response of participants and visiotors

– any other relevant details

5. **LETTER WRITING**

[Note: - No marks are to be awarded if only the format is given. Credit should be given to the candidate's creativity in presentation of ideas. Use of both the traditional and the new format is permitted. However, mixing up of the two is NOT acceptable.In the job application the bio-data may be written separately or within the letter.]

Format	2 marks

(1. sender's address, 2. date, 3. receiver's address, 4. subject heading, 5. salutation, 6. complimentary close.)

Content	4 marks
Expression	4 marks

Grammatical accuracy, appropriate words and spellings [2]

Coherence and relevance of ideas and style   [2]

Suggested value points:

(APPLICATION FOR JOB)

– post applied for
– qualifications: Academic, Professional
– experience / positions held
– references
– salary expected (optional)
– contact address & telephone number

OR

Suggested value points:

(LETTER TO EDITOR - HARMFUL EFFECTS OF CIGARETTE SMOKING)

– statutory warning on cigarette packs
– censorship of all cigarette smoking scenes in Indian cinema
– harmful effects
    – cancer, T.B., Asthma, respiratory & other health problems
    – harm to passive smokers
    – wastage of money, health
    – bad habit, wrong lesson to others
– recent steps taken by Finance Minister - increasing the price of tobacco products
– any other relevant point

6. **ARTICLE**

Format (Title and writer's name)   1 mark

Content   4 marks

Expression   5 marks

    Grammatical accuracy, appropriate words and spellings [2½]

    Coherence and relevance of ideas and style   [2½]

Suggested Value Points

(FLOODS IN MUMBAI)

– inefficiency and indifference of the local administration
– role of common man in reaching out to the distressed
– indomitable spirit of the common man
– how common man can realize his own powers and help rebuild a "new and clean India"
– any other relevant details

OR

Suggested Value Points

(PROMOTING TOURISM)

– present situation

– government's apathy (indifference)

– steps the government could take to promote tourism

– providing – better transport, telecommunications, infrastructure, hotels, airports, railway stations etc.

– any other relevant details

SECTION C : LITERATURE

7. [This question has been designed to test the students' understanding of the text and their ability to interpret, evaluate and respond to the questions based on the given stanza. In other words it attempts to test their reading comprehension ONLY.]

Value points:

(a)	(i).	– the lily flower / lily	1 mark
		– has a short life	1 mark
	(ii)	shows the contrast : the lily lives only for a day but spreads its beauty and happiness all around	1 mark
	(iii)	a short but meaningful life is preferable to a long but useless life / we must spread happiness with our deeds and words / life is to be measured in terms of achievements and not by the number of years a person lives	1 mark

OR

(i)	life of slavery / enslavement/ dependent / no free will / no freedom / servitude / subjection	1 mark
(ii)	living in a puppet's world / being slave / dependence on others	1 mark
(iii)	movements started through brainless wires, mindless habits / figures wait with patience and obedience; stirred into a moment's mimicry of life.	2 marks

(b) **Short answer type questions (Poetry)**

Distrubution of marks :

Content   1 mark

Expression   1 mark

(deduct ½ mark for two or more grammatical/spelling mistakes)

Value points

(i)   –   the narrator kills the other man because they meet on the battlefield

        –   both (the narrator as well as other soldier) had joined infantry as they were out of work

        –   the narrator would have offered the other man a drink or would have helped him monetarily if they had met elsewhere   2 marks

(iii)   –   man should live in peace and harmony with nature

        –   he should live in peace with other human beings also

        <u>Man's Indifference</u>

        –   by not accepting nature's holy plan

        –   by not living in peace with nature and man   2 marks

(iii)   –   people used to laugh in earlier times with their hearts and with their eyes

        –   shook hands with their hearts

        –   were sincere and true in expressing emotions   2 marks

8.   **Short answer type questions (Prose)**

Questions are to be answered in 30-40 words.

Distribution of marks:

Content: 1 mark

Expression   1 mark

(deduct ½ mark for two or more grammatical/spelling mistakes)

Value points:

(a)   Algernon's imaginary friend, projected as a dreadful invalid

     –   gave an excuse to Algernon to go down into the country   2 marks

(b)   Steps to Heaven

     –   death at gallows

     –   freedom

     –   becoming martyrs

     Gates of Hell

     –   enslavement

     –   being exiled to the Andaman Islands

     Why

     –   they were spared execution but were being transported to the Andaman Islands in handcuffs and fetters (bound hands and legs)   2 marks

(c) – rural and urban India

– ancient and modern India   2 marks

(d) Epochal and revolutionary

– women came out for the first time to shoulder the responsibility of a work which was physically challenging

– actively participated – boycott, civil disobedience, picketed liquor shops

– broke all "Social Taboos"

– majority involved in Gandhian movement   2 marks

(e) – despite his blindness he was his own master and successful in life

– had survived the Westbury chemical explosion tragedy

– from being a skilled labourer he had become rich and successful

– though handicapped yet struggled hard, alone, to emerge successful

– gladly appreciated Nature   2 marks

9. [These questions have been set to test the students' understanding of the text and their ability to interpret, evaluate and respond to the issues raised therein. Hence no particular answer can be accepted as the only correct answer. All presentations may be accepted as equally correct provided they have been duly supported by the facts drawn from the text. The important thing is that the student should be able to justify his or her viewpoint.]

Distribution of marks:

Content   5 marks

Expression   5 marks

    Grammatical accuracy, appropriate words and spellings   [2½]

    Coherence and relevance of ideas and style   [2½]

Value points:

– extremely apt

– last day of Mr. Gupta's stay in London- Maggie gives him one shilling to buy flowers to be laid on her brother's grave in India.

– spirit of supreme sacrifice – brought tears to his eyes

– love of a sister for a brother

– aware that in India (a) Flowers are cheap (b) Flowers in abundance

– yet takes the money from her – did not want to deprive her of the joy this sacrifice would give her

– flowers epitomize a sister's love for a brother

Support

- more and better machinery means more production of material goods
- more material goods mean no poverty or destitution, therefore more happiness
- machines confer power, therefore they are valued

Against

- machines dominate human beings and make them less human and more like machines themselves
- cause pollution and destitution
- no happiness from material wealth
- deprive us of spontaneity and variety

10. Distribution of marks:

Content   3½ marks

Expression   3½ marks

    Grammatical accuracy, appropriate words and spellings [2]
    Coherence and relevance of ideas and style   [1½]

Value Points:
Master story teller

- made up a story instantly after listening to others
- narrated a story with real names, place, in first person showing how he himself was affected by it
- captivated everybody by talking of a face on the wall resembling a real person

How the group was gulled

- told the group that it wasn't a real story
- had made it up in the last half an hour
- the end was an anticlimax   (any one)

- unlike in olden days handicapped people are not killed
- today there are 120 organisations for the disabled
- there are more than130 wheelchair basketball teams
- a totally deaf woman holds the world record for driving a vehicle on land
- the President of Hofstar University is a man with cerebral palsy
- blind skiers have made a name for themselves
- plays and movies have been made on handicapped people
- the present is most favourable time for the handicapped people to live

11. Short answer type questions

Questions are to be answered in 30-40 words.

Distribution of marks :

Content : 1 mark

Expression : 1 mark

(deduct ½ mark for two or more grammatical/spelling mistakes)

Value points :

(i) – felt vindicated
   – felt good and relieved that his honesty and sincerity had finally been recognized and rewarded   2 marks

(ii) – none of the Wangs had been killed
   – the Wangs had not seen a Japanese in their life
   – had not seen any evidence of the war so far   2 marks

(iii) – the young boys and girls had not been with him since their childhood
   – they had been brought up in different conditions and environments
   – they did not belong to the same religion
   – no trained teachers available
   – lack of resources and literary equipments
                              (any two)   2 marks

(iv) – equipped with physical strength and stamina
   – intellect, patriotic fervour, spiritual values that lead to fearlessness
   – play a positive role in the restructuring and strengthening of economy of nation
   – immense burst of idealism and energy
   – deep commitment to the task of safeguarding the country
   – physical, intellectual, patriotism, spiritual dimensions
                              (any two)   2 marks

QUESTION PAPER CODE 1/1

EXPECTED ANSWERS/VALUE POINTS

SECTION A : READING

1. COMPREHENSION PASSAGE

(a) NOTE: No marks should be deducted for mistakes of grammar, spellings, or word limit. Full marks may be awarded if the student has been able to identify core ideas.

(i)   –   reputed as the technology nerve centre

      –   back office to world

      –   production centre   (any two)

      –   unique cultural identity / secularism / democracy / role model

           (if only the second part has been done 1 mark)   1+1=2 marks

(ii)   –   more than half the country below 25 years of age / more than one

         third under 15 yrs of age / majority of population young   1 mark

(iii)   –   if the youth are not properly educated

      –   if enough jobs are not created   1+1 = 2 marks

(iv)   –   high drop out percentage rate

      –   80 million children in the age group 6-14 do not attend school

      –   slow industrialization

      –   slack domestic economy

      –   intricate / inflexible labour laws

      –   lack of capital

      –   control on foreign investment

      –   bureaucratic hurdles / red-tapism

                   (any one)   1 mark

(v)   –   the 30,000 outdated statutes / restrictive laws / too many laws   1 mark

(vi) ensure each child is educated / raise infrastructure spending coupled with rapid privatization / relax labour laws / create employment opportunities for the educated youth / understand the aspirations and urgency of its youth / participate in democracy / take advantage of economic reforms / awaken to the fact that they can wield immense political power / business pursuits / educational charities / inviting more foreign direct investments

                   (any two)   2 marks

(b)   (i)   breathtaking   1 mark

     (ii)   boom   1 mark

     (iii)   capital   1 mark

2.   **Note:**

If the student has attempted only summary or notes, due credit should be given.

1 mark for title be given if the student has written the title in Q2(a) or Q2(b) part

Min. 3 main headings and 3 sub headings for content

The notes provided below are only guidelines. Any other title, main points and sub-points should be accepted if they are indicative of the student's understanding of the given passage and the notes include the main points, with suitable and recognizable abbreviations. Complete sentences should not be accepted as notes. If a candidate writes complete sentences, deduct ½ mark from the total.

Numbering of points can be indicated in different ways and these should be accepted as long as a consistent pattern is followed.

(a) **NOTE MAKING**

Distribution of Marks

Abbreviations / Symbols (with /without key) — any four   1 mark

Title   1 mark

Content (minimum 3 sub headings with proper indentation and notes)   3 marks

Suggested Notes

Title: Vagaries of Weather / Nature's Fury / Global Warming / Climate Change / any other suitable title

1. Massive heat wave, chaos across Cen. East. Europe
   1.1 1000s. face massive relief oprn.
   1.2 death toll mounting
   1.3 forest fire under control in Portugal
   1.4 situn. imprvd. in some countries

2. Damages
   2.1 1000s. evacuated
   2.2 many villages abandnd.
   2.3 flooded houses & landslides
   2.4 Germany worst hit

3. Reasons behind the bedlam
   3.1 jet stream, high speed winds
   3.2 global warming
   3.3 other factors also present
   3.4 climatic changes due to NAO

(b) **Summary**

The summary should include all the important points given in the notes.

Content: 2 marks

Expression   1 mark

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SECTION B : ADVANCED WRITING SKILLS

3. **ADVERTISEMENT**

Content	3 marks
Expression	2 marks

Suggested Value Points

Title: SALE AND PURCHASE / CAR FOR SALE / FOR SALE

– car make and model

– kilometers covered

– colour / condition / price

– any other relevant details

– contact name and address / telephone no.

OR

POSTER

Content	3 marks
Expression	2 marks

Suggested value points:

Title: BE PREPARED / WAKE UP CITIZENS / LEARN DISASTER MANAGEMENT / any other

– should highlight dangers and suffering

– precautionary measures – go into open space / watch out for tremors / any other

4. **LETTER WRITING**

[Note: - No marks are to be awarded if only the format is given. Credit should be given to the candidate's creativity in presentation of ideas. Use of both the traditional and the new format is permitted. However, mixing up of the two is NOT acceptable.]

Format	2 marks

1. sender's address, 2. date, 3. receiver's address, 4. subject heading, 5. salutation, 6. complimentary close.

Content	4 marks
Expression	4 marks

Grammatical accuracy, appropriate words and spellings [2]

Coherence and relevance of ideas and style   [2]

Suggested value points:

(LETTER OF ENQUIRY)

– reference to advertisement

– information to be given: choice of destination, group size, tentative dates suitable to you

– requirements/ enquiries : discount, passport, visa, itinerary, type of hotel, airways and timing / any other

<div align="center">OR</div>

Suggested value points:

(LETTER TO COMMISSIONER OF POLICE)

– reference to the news item, police criminality increasing

– police need to restore public image, faith and trust

– law protectors turning law breakers and criminals

– suggestions: need for tight monitoring, punish offenders, transparency in handling matters, public awareness, taking measures so that the innocent are not exploited, curb temptations to accept bribe, reminder of oath and commitment to nation and citizens, need to do soul searching / any other

  (any two)

5.   **REPORT WRITING**

Format   1 mark

Title and reporter's name,(date and place - optional)

Content   4 marks

Expression   5 marks

  Grammatical accuracy, appropriate words and spellings   [2½]
  Coherence and relevance of ideas and style   [2½]

(YOUNGSTERS GIVE A NEW LOOK TO COLONY/ any other relevant heading)

Suggested Value Points

– what

– when

– where

– who   (whichever applicable)

– detailed description to include birth of idea, team working, motivation, planning and execution, difficulties, how they were overcome, sense of achievement, satisfaction

– any other relevant details

<div align="center">OR</div>

(BOOK WEEK)

Suggested Value Points
- what
- when
- where
- why   (whichever applicable)
- other details: activities, preparation, participation and visit of eminent people, usefulness
- any other relevant details

6.   ARTICLE WRITING

Format (Title and writer's name)   1 mark

Content   4 marks

Expression   5 marks

Grammatical accuracy, appropriate words and spellings [2½]

Coherence and relevance of ideas and style   [2½]

Suggested Value Points
(INDIAN TV DOING GREAT SERVICE)
- reference to different programmes and channels
- service to people: through 24 hours of the day
- wide choice / variety to cater to all age groups
- information and news at your doorstep
- educational value of some programmes such as helpline, discussion, animal planet, history channel, national geographic etc.
- thrust to economic activity, aid to industry, employment opportunities
- common man brought to limelight
- any other relevant point

<div align="center">(any four)</div>

<div align="center">OR</div>

Suggested Value Points
(BIRTH OF A GIRL CHILD – NOT WELCOME)
- reference to survey findings
- personal views and reactions
- importance of women
- suggestions: law to safeguard / need to educate and inform women about their rights/ highlighting women achievers in print / electronic media / strict punishment for violators
- any other relevant point

<div align="center">(any four)</div>

<div align="center">**32**</div>

SECTION C : LITERATURE

7. [This question has been designed to test the students' understanding of the text and their ability to interpret, evaluate and respond to the questions based on the given stanza. In other words it attempts to test their reading comprehension ONLY.]

Value points:

(a) (i)   – the narrator / speaker / soldier, the enemy he killed   ½+½= 1 mark

(ii)   they do not have personal enmity / would have met as friends if not on battle field / war makes enemies of normal human beings   2 marks

(iii)   – measure for liquor / alcohol   1 mark

<div align="center">OR</div>

(i)   – in the temple court of Benaras   1 mark

(ii)   'To him who loveth best, a gift from Heaven.' / that it was a gift from heaven for the person who loves mankind the best   1 mark

(iii)   God showers his love on those who have selfless love / sympathy / mercy for mankind   2 marks

(b) **Short answer type questions (Poetry)**

Distrubution of marks :

Content   1 mark

Expression   1 mark

(deduct ½ mark for two or more grammatical/spelling mistakes)

Value points

(i)   Slavery – our shackles that prevented our progress of marching ahead bravely into a resplendent future / the burden was the slavery that prevented progress / caused loss of dignity / courage / identity / vision   2 marks

(iii)   Because it blooms in daylight / adds joy to the beholder   2 marks

(iii)   –   Wonder – unbounded joy at the various sounds, sight and activities of birds and animals living in harmony

          –   Sadness to think of what man has made of man   2 marks

8. **Short answer type questions (Prose)**

Questions are to be answered in 30-40 words.

Distribution of marks:

Content: 1 mark

Expression   1 mark

(deduct ½ mark for two or more grammatical/spelling mistakes)

Value points:

(a) Maggie and mother worried about brother in India – no news, heard India was a country of snakes and tigers, feared he might have been killed, wanted to know if it was true   2 marks

(b) Machines deprive us of spontaneity and variety and make life mechanical and monotonous   2 marks

(c) It couldn't make inroads among the common masses. Confined only to a small and educated section of women   2 marks

(d)   –   though tedious, provides many opportunities
      –   opens before us a great literature which is still unknown
      –   allows insight into thoughts deeper, than any other we have known before
      –   appeals to the deepest sympathies of the human heart
                               (any one)   2 marks

(e) Mr. Worthing was an orphan whose parentage was not known. Gwendolen was brought up with utmost care, could not be given away to a person whose lineage could be linked to a parcel and cloakroom (i.e. a person who could not establish a proper lineage)   2 marks

9.   [These questions have been set to test the students' understanding of the text and their ability to interpret, evaluate and respond to the issues raised therein. Hence no particular answer can be accepted as the only correct answer. All presentations may be accepted as equally correct provided they have been duly supported by the facts drawn from the text. The important thing is that the student should be able to justify his or her viewpoint.]

Distribution of marks:

Content   5 marks

Expression   5 marks

Grammatical accuracy, appropriate words and spellings   [2½]
Coherence and relevance of ideas and style   [2½]

Value points:

–   death by hanging – only suffering for a few moments – better than death in exile

–   Andaman – life long suffering and repeated torture

–   jailor cruel, prisoners made to do hard laborious work

–   tropical diseases rampant – often fatal

– climate hot and humid – difficult to live in

– even if one was released he had no way of coming back home

– would be exposed to more dangers from the unfriendly aborigines

– any other relevant point

(any five)

OR

Mr. Parsons' characteristics / qualities / handicaps / rise in status

The story brings out the contrasting attitude and qualities of Parsons and Markwardt

Parsons

– positive / optimistic

– determined

– diligent

– rises above his handicaps to emerge successful

– enjoys life   (any three)

Markwardt

– negative / pessimistic

– escapist

– cries over his handicap

– indulges in self pity

– lives the life of a beggar

–   life – a burden for him

– though a villain yet projects himself as a victim

(any three)

Note: students must bring out a sharp contrast between the attitudes and character of Parsons and Markwardt by quoting relevant incidents from the story to substantiate the given statement.

10. Distribution of marks:

Content	3½ marks

Expression	3½ marks

Grammatical accuracy, appropriate words and spellings   [2]

Coherence and relevance of ideas and style   [1½]

Value Points:

– listened to everyone's stories about the inexplicable mystery of supernatural

– acceded to the request of the group and made up a story on the spot

- said he was going to narrate a real story and said truth was stranger than fiction
- put himself as the main protagonist
- left the group literally mortified
- finally disclosed that he had made up the story thus surprising the group with his anticlimax
- by telling about such strange coincidences, he was able to fool the group first and later by revealing the truth, he made them realize the futility of their exercise

<div align="center">(any four)</div>

<div align="center">OR</div>

- wins sympathy because of her extraordinary qualities
- wise – village respects her wisdom
- loving and caring
- superstitious and ritualistic – donates to get her husband out of purgatory – fears the river
- ignorant of outside world – does not know how the Japanese could be different
- not afraid of destruction – the river has taught them how to build again
- refuses to accept that Japanese were waging a war
- innocent curiosity – wants to see the flying machine
- helps the Japanese soldier
- intelligent and brave – stops the enemy from advancing once she realizes the threat – opens the sluice gates knowing fully well that she would be drowned

<div align="center">(any four)</div>

11. **Short answer type questions**

Questions are to be answered in 30-40 words.

Distribution of marks :

Content :	1 mark
Expression :	1 mark

(deduct ½ mark for two or more grammatical/spelling mistakes)

Value Points:

(i)   no one is perfectly happy. Everyone suffers from some physical or mental shortcomings.   2 marks

(ii)   regretted the moment / a trial of his own honesty as he had been asked by family members to give a misleading statement to save Gresham, had been offered a hundred thousand dollars by Gresham   2 marks

(iii) –   the long confinement helped him gain wisdom / read widely during confinement including philosophy, religion, spiritualism

      –   realized the futility of material wealth / knew it would not give him any more pleasure

      –   so let the banker have false pleasures   2 marks

(iv) Barin had stolen Pulak's alarm clock. Its presence was a continual reminder of Barin's guilt / feared the continuous alarm would expose him   2 marks

FUNCTIONAL ENGLISH

Time allowed : 3 hours   *Maximum Marks : 100*

General Instructions :

*(i)   The paper is divided into **four** sections : A, B, C and D. All the sections are compulsory.*

(ii)   Separate instructions are given with each section and question, wherever necessary. Read these instructions very carefully and follow them faithfully.

(iii) Do not exceed the prescribed word limit while answering the questions.

QUESTION PAPER CODE 212/1

SECTION A : READING   (20 marks)

1.   Read the following passage :

1.   Prema Dhanraj was eight when a stove on which she was making coffee burst and the flames leapt up to swallow her face. Prema was a beautiful child with dark almond eyes and chiselled features. But on that fateful day in 1965, within seconds, her face had melted into a mass of flesh.

2.   She was admitted to Christian Medical College Hospital, Vellore, with 50 per cent burns. Seeing her first-born battle for life, Rosie, her mother made a pact with God. "If you save my child, I vow to dedicate her to the service of your people. I will make her a doctor and work in this same hospital," she prayed.

3.   Prema survived. Dr. L.B.M. Joseph, renowned surgeon, painstakingly reconstructed every inch of Prema's face. "It was excruciatingly painful," recollects Prema. "I used to be angry with the doctors all the time." After six months in the hospital, Prema returned to Bangalore to resume school. Her scarred face attracted attention; it baffled, confused and embarrassed people. School was never the same again. Prema completed high school privately.

4.   "My family had hidden all the mirrors in the house. Only after a year I happened to catch a reflection of my face in a mirror. I cried. I was angry. I threw tantrums. My mother waited patiently for my tears to dry." Then she told Prema, "This is your face and you will have to live with it. No one can change that. But what you do with your life is in your hands and only you can change it." It was a hard lesson to learn. And it took her a long time to grasp its meaning.

5. "I barely scraped through my Class 10 exams," Prema reminisces. "But the fact that I cleared my exams gave me immense confidence." She obtained a B.Sc. degree and Prema admits, "Those were the most difficult years of my life — academically and socially."

6. Between 1965 and 1971, Prema underwent 14 reconstructive surgeries before she put an end to it. "It was time for me to concentrate on other things in life." Prema obtained her MBBS degree in 1980, and went to work at CMCH, Vellore, under Joseph, thus fulfilling her mother's promise to God. She specialised in Plastic and Reconstructive Surgery.

7. Today Prema is known as one of the most successful surgeons in the medical fraternity, with a success rate of 99 per cent. A recipient of many awards, currently, she is helping set up the first burns unit in Ethiopia, which has the maximum number of burns victims in the world. Prema was invited by the Ethiopian and Norwegian authorities to train doctors in Ethiopia and she trained Ethiopia's first plastic surgeon. She has also pioneered a programme in collaboration with U.S. — the "Smile Train" Project — where all patients with cleft lip and cleft palate will be given free treatment at CMC, Vellore. She is further involved in training doctors from Kenya and Tanzania. Her first Kenyan student will arrive in Vellore by October 2005.

8. Prema agrees that bitterness and anger were a part of her life for a long time. "My mother taught me how to channelise my negative emotions in a positive manner." Today, Prema's only regret in life is that her mother is not alive to witness her success in life. "She would have been happy and proud." However, those dark days are now behind her. "If not for my accident I wouldn't have achieved so much in life. I have got more than I bargained for. I never thought that I could reach far in life with my face."

9. Even today, her patients are taken aback when they see her. But soon, her face becomes a source of encouragement and confidence. They feel that if she can do it, so can they. "Children feel encouraged and confident once they see me and hear my story," she says.

10. Prema's advice to all those who feel defeated in life: "Stop comparing yourself with others. Be willing to face reality and move on in life. Develop a cheerful attitude. Be humble and trust in God. Then sit back and enjoy life."

11. Prema says that all her dreams have been fulfilled or nearing fruition. Yet, she has one last dream left. "I should have a quick death and when people see me they should say, 'she looks so beautiful and peaceful'. I want to look more beautiful than I am now when I meet my Lord." One of her patients puts it in perspective : "All that is striking and beautiful is not always good but that which is good is always beautiful."

1.1 On the basis of your understanding of the passage answer the following :

    (a) How did Prema fulfill the promise that her mother had made to God?   2

    (b) What made Prema angry when she was being treated in the hospital ?   1

    (c) Why had Prema's family hidden all the mirrors in the house ?   1

    (d) "This is your face and you will have to live with it. No one can change that." What message was Prema's mother trying to give her ?   2

    (e) Do you consider Prema to be a beautiful person ? Give reasons for your answer. (At least 2 reasons)   2

1.2 Pick out the words from the passage which mean the following :   4
    (i) Well defined/strong (para-1)
    (ii) extremely (para-3)
    (iii) recalls/recollects (para-5)
    (iv) completion (para-11)

2.   Read the passage given below :

Climate change is the phenomenon caused by global warming. Natural cycles of warming and cooling have occurred many times in Earth's history, and indeed the rise of Homo sapiens is attributed to the end of the last Ice Age some 11,000 years ago. What worries scientists is man-made global warming — when carbon-rich fuels stored for aeons beneath the ground are extracted and burned, releasing billions of tonnes of carbon dioxide (CO_2) each year. This is a "greenhouse gas" : it traps the sun's heat in the atmosphere instead of letting it radiate out to space. As a result the Earth's surface is warming, disrupting the planet's delicate climate system.

The more CO_2, the higher the temperature and the higher the temperature, the bigger the impact. At the lower range of the Intergovernmental Panel on Climate Change estimates, there will be a tiny increase in global sea levels and some increased water stress, and some regions in higher latitudes may, in fact, benefit. At the higher range, droughts, floods and storms will become more violent and more frequent, mean sea levels could rise by up to 88 centimetres (2.9 feet) by 2100, creating an exodus of "climate refugees". Almost all of the world's population will be affected, but poor tropical countries will be hit worst.

A top science conference in February declared that climate change is already underway, visible through glacier shrinkage, melting of polar ice, shifts in rainfall patterns and heat waves. Experts say that if the world wants to keep to the bottom end of the IPCC temperature estimates, global emissions of CO_2 will have to peak in 2020 and then fall to half of today's levels by 2095 — a tall order, given that developing countries and the U.S., are gobbling up fossil fuels.

The obvious answer : stop using fossil fuels and use clean energy sources such as wind, solar, hydro and hydrogen. But this is easier said than done. Oil, gas and coal are the world's long-established energies and have big advantages in cost and efficiency over technologies that are still in their infancy and need tax breaks or regulatory help to make headway. In addition, the fossil-fuel lobby is fighting a fierce rearguard action, particularly in Washington, to keep its crown. Over the next couple of decades, the best hopes may lie in interim solutions such as better fuel efficiency, promoting hybrid cars and storing CO_2 underground from coal as the fuel is burned rather than letting the damaging gas escape into the air.

The U.N. 's Kyoto Protocol requires industrialized countries to limit their emissions of greenhouse gases by a 2012 timeframe as compared to a 1990 benchmark. It took effect last February, surviving abandonment by the U.S., which opposed binding targets as too expensive for its economy, and foot dragging by Russia. But Kyoto remains in a bad way. Even its European champions are having big problems meeting their pledges. The treaty is criticized for making only timid cuts (just one or two per cent at best, after the U.S. walkout), for being complex and for not including countries which are big polluters, in commitments on emissions cuts. Negotiations for the post-2012 Kyoto start in Montreal in November.

(a) On the basis of your reading of the above passage make notes on it using headings and sub headings. Use recognizable abbreviations wherever necessary. 5

(b) Using your notes write a summary of the above passage in 80-100 words. 3

SECTION B : WRITING (30 marks)

3. You are Shalini/Sohan a member of an NGO *Jagriti* which is trying to spread awareness about the necessity to save water. Design a poster for the organization about this issue in not more than 50 words. 5

4. Bhaskar Chandra visited Leh during his summer break. He jotted down few facts about the area since he was required to write a factual description of the place for a brochure. Using the points given below write the description for him.

(Word limit 80-100 words) 5

Location - Ladakh district - east of Srinagar - surrounded by Himalayas -Zanskar River

Climate - winter temperature - below zero - best time - July to September

Popular cuisines - Tibetan and Kashmiri

Souvenirs - paintings / prayer wheels / music bowls / carpets / shawls.

Sites to Visit - Shanti Stupa - Leh Palace - once home to royal family - Namgyal Tsemo Gompa - beautiful monastery - has three-story high Buddha image and ancient manuscripts.

5. Krishna Surya of 2/3 Navi Sarak, Chandi Road, Mumbai sees this advertisement. He is interested in joining these classes. He decides to write a letter to the Director of Creative World asking him details of the course - the fee structure; the date of starting the course; availability of transport and other relevant details. Write the letter for him. (125-150 words)

LEARN PAINTING AND SKETCHING

AT

CREATIVE WORLD

On

Canvas/Glass/Fabric

For further details contact undersigned :

Director

Creative World

E-234 Great Noida

UP

Or 10

Is hanging a cruel and unusual punishment ? The execution of a person accused of a callous murder of a teenager, brings the curtain down on a debate over the wisdom of retaining the death penalty. Write a letter to the editor regarding this issue either in support or against this form of punishment. You are Kamini/Kaushal of 2/34R, Akbar Road, Lucknow. (125-150 words)

6. Read the given news headline.

Competitive exams test problem-solving skills and application of theory

Problem solving skills are not an indicator of holistic assessment

Entrance exams stress students

Mushrooming of coaching centres - exhorbitant fees

You are Abha / Abhishek Saran, a student of class XII. You read these news items and decide to write an article for the local newspaper on your views regarding the current state of entrance examinations prevalent in the country. (150-200 words) 10

Or

You are Meghna / Magadh. You are upset at the kind of photographs being published in the leading national dailies. Newspapers prefer to print photographs that expose the body of sports women and others rather than speak about the quality of their work. Write an article on the growing trend towards sensationalising news.

(150-200 words)

SECTION C : GRAMMAR (15 marks)

7. Rearrange the words in the following sentences to make complete sense. The first one has been done as an example : 3

> *a lot of/requires/mountaineering/a/expedition / careful planning.*
> *A mountaineering expedition requires a lot of careful planning.*

1. and / waterproof tents / light warm / the equipment / includes special oxygen cylinders, / clothing/

2. no footholds / have to make / climbers / over walls of rock / their way / where there are /

3. they carry / this dangerous path / their tents, /across / food and everything else / instruments, / they may require.

8. The following passage has **ten errors.** Identify the errors in each line and write them along with the <u>corrections</u> as shown in the example. 5

	Incorrect	Correct
Many people thought that theoretical	thought	think
(a) science is higher than the practical ones. But there		
(b) is the connection between the two. A study		
(c) of astronomy, seems at first sight to having no		
(d) practical important. Yet the science of		
(e) astronomy develop from the practical		
(f) need of people which crossed deserts and		
(g) oceans. Navigation uses astronomy to establishing		
(h) direction and position. That desire to know more		
(i) has resulted into the making of optical instruments		
(j) likes the telescopes.		

9. Robert / Rachna Sood decides to buy a colour TV. Frame 8 questions that he/she could ask the salesman regarding the best TV available: the price, clarity of picture, any special features, no. of channels, home installment and discounts if any. 4

10. Raj / Rajni applied for a job at a call center. He/she appeared for the interview. Write three sets of dialogue that he/she had with the interviewer with help from the hints given below.   3

Qualifications - reason for applying - can work at night - salary expectations

Example :

Interviewer : Good morning Mr. Raj. Can you tell me something about yourself ?

Raj   : I have just completed my graduation.

SECTION D : LITERATURE   (35 marks)

11. Read the following extract and answer the questions that follow :

"No doubt they'll soon get well; the shock and strain
Have caused their stammering, disconnected talk.
Of course they're 'longing to go out again,'-
These boys with old scared faces, learning to walk.'

(a) Name the poem and the poet.   1

(b) Who are the 'boys' referred to in the last line ?   1

(c) Who or what is responsible for their stammering and disconnected talk ?
     What are they suffering from ?   1

(d) Who is the speaker of these lines ?   1

(e) Comment on the line 'Of course they're longing to go out again'. Do you
     think the speaker is correct in his opinion ?   2

Or

'Is it so easy, then ? Goodbye no more than this
Quiet disaster ? And is there cause for sorrow
That in the small white murder of one kiss
Are born two ghosts, two Hamlets, two soliloquies,
Two worlds apart, tomorrow ?

(a) What is the 'quiet disaster' being mentioned in the second line ? What is the
     poetic device used here ?   2

(b) Who are the two Hamlets mentioned here ? Why have they been compared
     to Hamlet?   2

(c) Pick out two ironical facts mentioned here ? And explain why they are
     ironical ?   2

12. Answer any **three** of the following in about 50 words :　　　　　　3×3=9

(a) In the poem 'Of Mothers, Among Other Things', what starts the chain of memories about the narrator's mother ? How has she changed with age ?

(b) Why does Archibald Macleish compare a good poem to a flight of birds ?

(c) In the poem 'Sympathy', what are the sights, sounds and smells of spring that agitate the caged bird ?

(d) Who has autumn been personified as in the poem 'Ode to Autumn' ? What were the activities it was performing in and around the fields ?

13. Answer any **one** of the following in about **80-100** words :　　　　　5

What was Alexander's relationship with Queen Mother like ? Why had Alexander sent Perdiccas to Babylon ? Why was Perdiccas late in returning from this mission ? What surprised him on reaching Alexander's camp ?

Or

'Mr. White does not believe in the powers of the monkey's paw.' Do you agree with this statement ? Give reasons for your answer.

14. Answer any **three** of the following in about **50** words each :　　　　3×3=9

(a) In the story 'What's your dream ?', what was responsible for the beggar's poverty stricken state ?

(b) What has turned into a rundown machine ? Why does the writer call it a run down machine ?

(c) What makes Lisa feel that 'life has become so tremendous that there is no longer any place in it for art.' ?

(d) 'With the absence of mental stimulus of this kind, human co-operation would be entirely impossible.' What is the mental stimulus referred to in this line ? When can this become dangerous for society ?

15. The night before Robichon's speech at Appeville-Sous-Bois, Quinquart writes in his diary about his apprehensions regarding the effect of Robichon's speech on his audience and reveals the plan he has in mind to prove himself to be the better actor. Write the diary entry in not more than 100-125 words.　　　　6

Or

Mrs. Malik expresses her bitter-sweet feelings about finally moving into her own house. She also looks back on her attitude towards her mother-in-law and how she feels to find herself in the same shoes now. Write about her feelings in not more than 100-125 words.

SECTION A — READING (20 marks)

Al.   Read the following passage :

1   Recently I attended a seminar on motherhood. It was well attended by people from different walks of life. When my turn came, I narrated an incident, which I had witnessed.

2   Manjula was a cook in Dr. Arathi's house. She already had five children when she became pregnant for the sixth time. She did not want this pregnancy.

3   Dr. Arathi had a different idea. Her sister was rich but childless and wanted to adopt a newborn baby. Arathi suggested : "Manjula, you have this baby and irrespective of the gender, my sister will adopt it. She does not stay in this place. So, you won't need to see the baby. She will also offer money, which will help with your other children's education. But the decision is yours and I will not insist."

4   Manjula thought over the idea and then agreed. She delivered a baby girl but when the time came to hand over the child, Manjula changed her mind. She started crying, "Madam, I agree that I am very poor. Even if I get a handful of rice, I will share that with this baby. But I cannot part with it. She is so tiny and dependent on me. Please pardon me."

5   Though she had five other children, suddenly this baby became very dear to her. Arathi and her sister were upset because they had been ready to welcome this baby into their home. But they understood.

6   I concluded my talk saying that I had often seen a mother ready to sacrifice everything for her children. There was much applause. I was satisfied, for my speech had come from my heart. I was about to step out of the building on my way to office when I saw Meera.

7   Meera teaches orphans in a school for the blind. She had come on behalf of her school to attend this seminar. I knew her fairly well. I asked her, "Meera how are you ?"

8   She was quiet for a minute. "I am fine. Madam, can you do me a favour ? Ahmed Ismail is supposed to drop me at school. But he just called to say he is stuck in a traffic snarl and will take more time. So can you drop me off ?" Ahmed Ismail was the kind-hearted Trustee of her school.

9   Meera's school was on the way to my office; so I agreed. I noticed that Meera seemed a little dull. "Meera, how was the seminar today ? Did you like my lecture ?" I was expecting a positive answer.

10   But Meera answered, "I didn't like your lecture. I'm sorry to say that but life is not like that."

11   I was taken aback, not because she had not liked my lecture but at her comment. I wanted to know the reason behind it. "Tell me, Meera. Why did you say that ? I have narrated a true incident. Sometimes truth is stranger than fiction."

12   Meera sighed, "Yes, Madam. Sometimes, truth is stranger than fiction. I will also tell you of a true incident. There was a five-year-old girl who was half blind. Her parents were both coolies. This little girl would complain that she could not see clearly. At last, they took her to a doctor. The doctor told them that the child needed an expensive operation or she would go blind, as she grew older. The parents talked to themselves and then took her to the bus-stand. There they gave her a packet of biscuits and told her, 'Eat the biscuits. We will be back in five minutes'."

13   "The child felt very happy at having a packet of biscuits all for herself, for the first time. She was jumping with joy and with her little vision she could see her mother's torn red sari. Time passed and it was getting cold. She could sense that the day was getting darker but her parents never turned up. The packet of biscuits was over long back. She was alone, helpless and scared. She called her parents and searched for the torn red sari. She went from pillar to post and there was no reply."

14   "What happened later ?" A kind-hearted man understood and took her to the blind school. The child waited for her mother, for several years, for a lady with a torn red sari. But no one turned up

15   I turned to Meera. She was crying. "Meera, how do you know all these details about that child ?"

16   Sobbing, she said, "Because I was that child. Now, tell me madam, how could my mother leave me like that ? I was deceived by a pack of biscuits. What happened to the motherhood that you spoke about ? Is it not valid even for my mother ? Is poverty more powerful than motherhood ? Answer me, Madam." I did not have any answer for her.

— Sudha Murthy

A1.1   On the basis of your understanding of the passage answer the following in your own words :

    (a)   Why did Dr. Arathi's maid eventually decide to have her sixth child ?   2

    (b)   Why could the maid not part with the child ? Give two reasons.   2

    (c)   Why was the writer taken aback at Meera's reaction to her lecture ?   1

    (d)   Why did Meera's parents take her to the bus stop ?   2

    (e)   How are Manjula's and Meera's stories different ?   2

A1.2 Pick out the words/phrases from the passage which mean the opposite of
the following : 3
(i) huge (para - 4)
(ii) fact (para - 11)
(iii) cheap (para - 12)

A2. Read the passage given below :

They are soft, come in a splendid array of colours, shapes and sizes and
though they are light, they are amazingly resilient and wonderfully strong. In fact,
they are one of nature's finest marvels. Do you know what they are ? Feathers !

The feathers on different parts of a bird's body are shaped differently, and
have varying uses. The flight feathers on a bird's wings are straight and stiff, while
those covering its body overlap each other to give the bird an aerodynamic shape
for efficient flight, and to keep out the wind and the water. A bird's body feathers
also act like a snug jacket, keeping the cold away from the delicate skin. The tail
feathers are used for lifting, steering, and braking and these are perfectly symmetrical
to allow a balanced flight.

Since feathers are absolutely vital for flight and for warmth, birds spend a
large part of their day cleaning and grooming their feathers by applying oil, bathing
in water or dust, scratching and preening. Preening straightens out the feathers so
they lock neatly together, and are smooth and unruffled. This is important, because
a preened feather presents a solid surface to push against air during flight. It is
incredible that birds also apply a kind of oil on their feathers with their beaks to
keep them in perfect shape.

Birds replace old feathers with new ones in a process called molting that
takes place one or more times a year. The number of feathers a bird has varies
from species to species. A Tundra swan may have over 25,000 feathers, while the
tiny humming-bird has only about 1,000. An adult turkey has about 3,500 feathers.

Feathers have always fascinated humans. Tribals in Africa and Asia and
the aborigines in Australia adorned their bodies with bright and colourful feathers.
The Red Indian tribes in North America used feathers to weave magnificent head-
dresses.

In Greek mythology, Daedalus tried to escape from his prison by attaching
feathered wings to his shoulders. Feathers have also been used as a stuffing in
beddings and pillows and in jackets.

Feathers are made of keratin, a protein that is also used to make horn,
hair and beaks. In human bodies, keratin makes up our nails and hair. Feathers
determine what a bird looks like, since they supply the bird with the colours they

come to be associated with. A crow's ebony colour is caused by its black feathers, and a canary's bright yellow hue, or a parrot's green one are all due to their feathers. Feathers are also useful to camouflage and protect birds.

A2.1   On the basis of your reading of the above passage, make notes on it using headings and sub-headings. Use recognizable abbreviations wherever necessary.   5

A2.2   Using the notes write a summary of the above passage in 80-100 words.   3

SECTION B — WRITING   (30 marks)

3.   You are Reena/Ram, the Sports Captain of Danapur National School, Patna, which is celebrating its Sports Day on the 24th of March. Design an invitation card to be sent to the parents and guests on this occasion. Mr. Rohit David, the famous athlete, will be the chief guest. Word limit : 50.   5

4.   Kajal/Karan of Jeevan Jyoti School, Kanpur is the Secretary of the School Social Service Wing. She/he was asked to write a notice for the school notice board informing students about the collection of old clothes/books/toys being organized for the poor. Write the notice in not more than 50 words.   5

5.   You are Meghna/Magadh. You are upset at the kind of photographs being published in the leading national dailies. Newspapers prefer to print photographs that expose the body of sportswomen and others rather than speak of the quality of their work. As a concerned citizen, write a letter to the Editor of your local daily newspaper expressing your anguish at the fall in the journalistic standards of newspaper reporting, which has been reduced to publishing only those news items and photographs which will sensationalize and thus increase circulation.

                                       (125 - 150 words)   10

OR

Jeena/Jeevan recently bought a new colour TV from M/s Tarun Sons and Co., Main Street, Pune but she/he is very upset because the set is not functioning properly. Write a letter to the Manager asking for a replacement for the set. (125-150 words)

6.   The Tiger Task Force report recommends : "The habitat must be shared between the people and the tigers, so that both can coexist, as they must. The poverty of one, otherwise, will be the destruction of the other." This report submitted by the Tiger Task Force restarts the debate on strategies to save the animal and at the same time protect the interests of people living in tiger reserves. You are Jagran / Jagriti. Write an article on the serious consequences of meddling with our environment and give suggestions on how to conserve our environment especially the endangered animals. (150-200 words)   10

OR

Is hanging a cruel and unusual punishment ? The execution of a person accused of a callous murder of a teenager brings the curtain down on a debate over the wisdom of retaining the death penalty. You are Sabina / Siddharth. Write a speech you want to give at your school's morning assembly regarding this issue, either in support of or against this form of punishment. (150 - 200 words)

SECTION C— GRAMMAR   15

7. Rearrange the following sentences in proper sequence to make a paragraph that makes complete sense :

(a) But the Nile did not flow evenly throughout the year.

(b) When men started farming crops in the Nile Valley in Egypt, they seemed to have perfect conditions for farming.

(c) Farmers have been faced with the problem of bringing water to dry lands from the earliest times.

(d) Therefore the Egyptians learnt how to control water and irrigate their lands.

(e) In summer it caused great floods, washing away precious soil.

(f) While in winter, the fields were dry and dusty and there was no water.

8. The following passage has *ten errors.* Identify the errors in each line and write them along with the <u>corrections</u> as shown in the example :   5

People generally think of <u>a</u> lion and the elephant   <u>a</u> — the

(a) as the most powerful animals in the earth.

(b) But power would come in small packages, too.

(c) The greatest natural dynamo are probably the little

(d) hummingbird. It was the smallest warm-blooded

(e) creature who has ever lived on earth. It is even tinier

(f) than some insects. It's tiny body is covered with

(g) nearly a thousand feather and in its body are

(h) powerful muscles or a wonderful blood-pumping

(i) mechanism. This small creature has the great urge to

(j) live. It lives a life filled in wild activity, but it does not live too long.

9. Your teacher had gone to America during the summer vacation to study the school system there. Frame eight questions that you would like to ask her regarding her observations on the items given in the box below : 4

> families, spending weekends, entertainment, lifestyle,
> food habits, travel, clothes, friends.

10. Shyam appeared for an interview for the post of a PT teacher in a school. He was interviewed by the Principal. Write out three sets of dialogues exchanged between the two with help from the points given in the box. The first one has been done as an example. 3

> Qualifications - MA Physical Education; Work experience - Total 12
> years - 6 in boarding school; specialization - basketball; personal
> achievements - national team member-5yrs; adjudged best young
> basketball player in college

Example :

Shyam : Good morning, sir. I am Shyam.

Principal: Good morning, Mr. Shyam. I see you are interested in joining the school as a PT teacher. What are your qualifications ?

SECTION D— LITERATURE 35

11. Read the following extract and answer the questions that follow :
> "I smell upon this twisted
> blackbone tree the silk and white
> petal of my mother's youth."

(a) Name the poem and the poet. 1

(b) What does the blackbone tree refer to ? 1

(c) Explain the term 'silk and white petal of my mother's youth.' 2

(d) Later on in the poem, the narrator talks about certain things associated with the mother's old age. What are they ? 2

OR

> "Think not of them, thou hast thy music too -
> While barred clouds bloom the soft-dying day
> And touch the stubble-plains with rosy hue."

(a) Name the poem and the poet.   1

(b) Who is the person referred to as 'thou' ?   1

(c) What is the 'music' being referred to in the first line ? Mention at least two
     sounds that form this music.   2

(d) What is meant by the expression 'stubble-plains' ?   1

(e) What is the picture created by the last two lines ?   1

12. Answer any ***three*** of the following in about 50 words each :   3×3=9

(a) What is the poet trying to convey through the title of his poem 'Sympathy' ?

(b) Justify the title of the poem'Curtain'.

(c) What do the parents of Sally in the poem 'Sally in Our Alley' do ? Why does
     she have to wait some time before she can marry the man she loves ?

(d) What are the features of a good poem as discussed by the poet Archibald
     Macleish ?

13. Answer any ***one*** of the following in about 80 - 100 words :   5
     Discuss the character of Alexander as depicted in the play 'The Adventure Story'.

                                    OR

     How does the White family get the monkey's paw ? Do you think they are happy
     to receive it ? Give reasons for your answer.

14. Answer any ***three*** of the following in about 50 words each :   3×3=9
(a) What makes Quinquart feel that Suzanne had 'been talking through her hat'?
(b) According to Einstein what should true education aim at ?
(c) Who were the Censors of Piety ? What were their duties ?
(d) Why did the Maliks decide to build their house in Delhi ?

15. Lisa changes from a little actress to a real actress, as a result of her experiences.
     Comment on her transformation. (100 - 125 words)   6

                                    OR

     After unburdening himself to his horse, Iona Potapov decides to write a letter to
     his daughter, Anissia, describing the cold, heartless people in the city, his growing
     sadness and the burden of having no one to share his grief with. Write the letter.
     (100-125 words)

Marking Scheme—Functional English

10. However where questions have been designed to test the writing skills of the students, expression (grammatical accuracy, appropriate vocabulary and style, spellings, organization and presentation of relevant matter in a coherent and logical way) is important.

11. Section C is on grammar. Care should be taken not to award marks to any inaccurate answer carrying errors in grammar and punctuation.

12. Wherever the word limit is given, no deduction of marks is to be made if the word limit has been exceeded by 25%. However, beyond the permitted limit marks are to be deducted as follows:

    a.   Penalty for exceeding the word limit for a 50 word answer - above 60, deduct ½ mark

    b.   For a 80 word answer   — Above 100 words, deduct ½ mark

    c.   For a 100 word answer — 125-150 words, deduct ½ mark
                                      — Above 150 words, deduct 1 mark

    d.   For a 125 word answer — 150-175 words, deduct ½ mark
                                      — Above 175 words, deduct 1 mark

    e.   For a 150 word answer — 175-200 words, deduct ½ mark
                                      — Above 200 words, deduct 1 mark

    f.   For a 200 word answer — 225-250 words, deduct ½ mark
                                      — Above 250, deduct 1 mark

13. If a student writes a single word in response to a short answer type question and it constitutes the core of the answer it should be accepted and awarded full marks.

14. If a student literally lifts a portion of the given passage as an answer to a question, no marks should be deducted for this so long as it is relevant and indicative of the desired understanding on the part of the student especially in Q.1 (Section A) and Q.11 (Section D).

15. **Please award full marks if the answer deserves it especially in the long answers i.e. Q.5, Q.6 (Section B), Q.13, Q.15 (Section D)**

EXPECTED ANSWERS/VALUE POINTS

SECTION A (READING) 20 MARKS

Q1.l	**READING**	**PREMA**	**TOTAL MARKS: 12**

Objective : To identify and understand main parts of the text.

Marking : As marked in the question paper. No penalty for mistakes of spelling and grammar.

Accept any other answer equivalent in meaning to the answers given below. (8 Marks)

Answers : (a) She became a doctor /dedicated herself to the service of the people   1

Worked in the same hospital in which she had been treated   1

(b) She was angry because the treatment was excruciatingly painful / consisted of constant reconstruction   1

(c) They did not want her to see her new face and get upset over it.   1

(d) That one has to learn to adjust with the changes that occur in life   1

No use crying over something that can't be changed   1

(She was the only one who could change it) / Bitterness and anger don't help.(any one))

(e) Possible answers - Yes,   ½

- has made a success of life without feeling bitter or frustrated
- dedicated her life to the service of her patients
- trusts God
- is always cheerful
- has channelized negative emotions in a positive manner
- has become a source of encouragement / motivation for others.

(accept any two of the above or any other relevant answers)   1½

1.2 VOCABULARY

Objective : to deduce the meanings of unfamiliar lexical items.

Marking : 1 mark each (4 marks)

Answers : 1. chiselled
2. excruciatingly
3. reminisces
4. fruition

Q 2.   Note making and Summarizing   **Total Marks: 8**

Objective : To develop the skill of taking down notes

To develop the extracted ideas into a sustained piece of writing.

Marking : Note making   5 marks

Heading and indentation   ½ + ½ mark

Abbreviations / Symbols   1 mark

(with or without key, minimum four)

Content   3 marks

(minimum three sub headings)

Important instructions:

The notes provided below are only guidelines. Any other title, main points and sub points should be accepted if they are indicative of the student's understanding of the given passage and the notes include the main points with suitable and recognizable abbreviations.

Complete sentences should not be accepted as notes. Half a mark should be deducted from the total if the student writes complete sentences.

Numbering of points can be indicated in different ways and these should be accepted as long as it follows a consistent pattern.

(a) Note making

Note : If the student has attempted only the summary or only the notes, due credit should be given.

Suggested Notes

Title : Global Warming / Global Warming-Matter of Concern (or any other similar, appropriate heading)

I. General facts

i.   causes climatic changes

ii.   occurred many times

iii. rise of Homo sapiens - end of last Ice Age - 11,000 yrs ago.

II. Present conditions

i.   man made

ii.   C-rich fuels extracted and burned releasing billions of tonnes of CO_2.

iii. Traps sun's heat in atmosphere.

iv. Result-warming, disrupting planet's delicate climate system.

III. Reasons for concern

   i.   more CO_2 - higher temp. - bigger impact

   ii.   intergovernmental Panel on climate change estimates at lower range

        a.   tiny increase in global sea levels

        b.   increased water stress

        c.   benefits some regions in higher latitudes

   iii. at higher range

        a.   more frequent & violent droughts, floods and storms.

        b.   Sea levels could rise by 88 cm by 2100.

        c.   Creating an exodus of climate refugees

        d.   Will affect world population

        e.   Poor tropical countries worst hit

   iv. Climatic changes already underway -

        a.   glacier shrinkage

        b.   melting of polar ice

        c.   shifts in rainfall pattern /heat waves.

IV. Solutions

   i.   Reduction of CO_2 emissions to half.

   ii.   Stop using fossil fuels.

   iii. Use wind / solar / hydro / hydrogen energy.

   iv. Promote hybrid cars.

   v.   Store CO_2 underground.

   vi. Problems

        a.   oil, gas and coal world's long-established energies, cost efficient

        b.   fossil-fuel lobby fighting to retain supremacy

V. U.N's Kyoto Protocol

   i.   Proposals

        a.   limiting green house gas emissions by 2012.

        b.   Effective from last Feb.

   ii.   Opposed by

        a.   US-considers too expensive for economy.

        b.   Foot dragging by Russia

        c.   Even European champions facing problems

   iii. Criticisms

        a.   Timid cuts just 1-2%

        b.   Non inclusion of big polluters.

Suggested Abbreviations (Minimum four)

1. yrs. - years

2. C - Carbon

3. temp - temperature

4. & - and

5. 88 cm-eighty eight centimeters

6. Feb. - February

   (any other suitable abbreviations)

(b) SUMMARY

Objective : 1) To expand notes into a summary

2) To test ability of expression

Marking : Content   2 marks

Expression   1 mark

Note : Considering the numerous facts mentioned in the notes about global warming, due consideration should be given to the students if they do not cover all the points in the summary which is expected to be concise. The summary should cover the essential details only.

SECTION B (WRITING)   TOTAL 30 MARKS

Q.3 POSTER: SAVING WATER   TOTAL 5 MARKS

Objective : To write in an appropriate style of a poster (blurbs, bullets, different font size etc. may be considered)

Marking : Format   1 mark

(Heading, issuing authority)

Content   3 marks

Expression   1 marks

(Coherence and relevance of ideas and style)

Suggested Value Points :

- Heading / slogan
- Issuing authority
- Why water should be saved?
- How it should be saved?

Q.4. **FACTUAL DESCRIPTION**   **LEH**   **TOTAL 5 MARKS**

Objectives :	To write in an appropriate style and format of a factual description.	

Marking :	Format (heading)	½ mark
	Content	2½ mark
	Expression	2 marks

Suggested Value points

- Location
- Climate
- Popular cuisines
- Souvenirs
- Site to visit.

Note :   The student who has used the format of a brochure should not be penalized.

Q.5   **LETTER OF ENQUIRY**   **TOTAL 10 MARKS**

Objectives :   To use an appropriate style to write a formal letter.
To plan, organize and present ideas coherently

Marking :	Format	2 marks

1. Sender's address 2. date 3. address of the addressee 4. salutation 5. subject 6. complimentary close 7. sender's signature/name

Content	4 marks

Expression	4 marks

(2 marks for Grammatical accuracy, appropriate words and spellings)
(2 marks for Coherence and relevance of ideas and style)

Suggested value points (any 4 of the following or any other)

- Seeking information about the course
- The fee structure
- Date of starting the course
- Transport facilities
- Timings
- Faculty
- Any other relevant details

<div align="center">**Or**</div>

LETTER TO THE EDITOR - CAPITAL PUNISHMENT

Note : The candidate may write either in support or against this form of punishment

Suggested value points

- Wisdom of retaining death penalty
- **For** - acts as deterrent
    removes threat
    safer society
- **Against** - innocent can be killed
    such punishments have not
    reduced the crime rate.
    no chance of reformation
    any other relevant points

Q.6 **ARTICLE** - **STATE OF ENTRANCE EXAMINATIONS**

Objective : To write in a style appropriate to the given situation.
    To plan, organize and present ideas coherently.

Marking : Format   1 mark
    (heading and writer's name)

    Content   4 marks

    Expression   5 marks
    (2½ marks for Grammatical accuracy, appropriate words
    and spellings)
    (2½ marks for Coherence and relevance of ideas and style)

Suggested value points

- Role played by coaching institutes in the present day system of education
- Reasons for popularity
- School education stresses theory while competitive exams stress problem solving skills and application of theory - hence demand growing.
- Solutions - various answers
- Change in examination/education pattern
- Bridge gap between school education and competitive exams
- Any other relevant point

Or

ARTICLE —MEDIA

Suggested Value Points

- mention newspapers printing objectionable photographs of female athletes / sportspersons / other women / male dominated society
- primary aim—to increase circulation of newspaper
- less coverage to achievements and quality work done
- mention effects of such irresponsible reporting on players / readers
- suggestions on how to deal with this problem
- other relevant information

SECTION C (GRAMMAR) 15 MARKS

Q7. REARRANGING **TOTAL: 3 MARKS**

Objectives : To be able to present ideas in grammatically logical sequence 3 marks

Marking : 1 mark for every correct answer

Answer

1. The equipment includes special oxygen cylinders, light warm clothing and waterproof tents.

2. Where there are no footholds, climbers have to make their way over walls of rock/ Climbers have to make their way over walls of rock where there are no footholds.

3. Across this dangerous path they carry their tents, instruments, food and everything else they may require. / They carry across this dangerous path their tents, instruments, food and everything else they may require.

Q8. EDITING **TOTAL: 5 MARKS**

Objectives : To use grammatical items appropriately

Marking : ½ mark each

If the candidate copies the sentence and replaces the incorrect word with the correct answer, marks should be awarded. However, if only the correct words are given, marks are to be awarded.

	Incorrect	Correct
a)	ones	one
b)	the	a
c)	having	have
d)	important	importance
e)	develop	developed
f)	which	who
g)	establishing	establish
h)	That	this/the
i)	into	in
j)	likes	like

Q9. FRAMING QUESTIONS   TOTAL 4 MARKS

Objectives : to understand the context and frame relevant and appropriate questions.

Marking : 1 mark each for every accurate question framed

Note : No marks to be awarded if there is any inaccuracy. The eight questions should cover at least any of the two areas specified for the interview in the given question.

Sample questions :

a) Which is the best TV available in the market these days?

b) What is the price of this TV?

c) What are its special features?

d) Is the company offering any discount on it?

e) Will you come and install it at home?

f) Can I see the different sizes of T. V. sets?

g) How clear is the picture on this one?

h) How many channels will I get on this TV?

Q10. DIALOGUE WRITING   TOTAL 3 MARKS

Objectives : to be able to extend a situation into a meaningful dialogue.

Marking : ½ mark each for every correct dialogue provided it is accurately and appropriately expressed. No marks should be awarded if there is any inaccuracy. This includes inaccuracies in grammar, spelling or punctuation.   3 marks

Sample Answers:

1. I:What are your qualifications?

2. Raj: I have graduated with Economics from Delhi University.

3. I: Why have you applied for a job in a call center?

4. Raj: I am very interested in the work done in a call center

5. I: But are you prepared to work at night and what are your salary expectations?

6. Raj: Yes I don't mind working at night and I would expect a salary in four figures

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SECTION D: LITERATURE   **TOTAL 35 MARKS**

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Q11. **REFERENCE TO CONTEXT**   **TOTAL 6 MARKS**

Objective : to test students' comprehension of poetry — local, global, interpretative, inferential and evaluative

Marking :   6 marks

Answers:

OPTION (1) SURVIVORS

a)	Survivors	½
	Siegfried Sassoon	½
b)	The wounded soldiers / combatants	½
	who have survived the war /returned from the war	½
c)	The war is responsible	½
	They are suffering the effects of the war/haunted nights / shattered dreams/disillusionment / a disorder called neurasthesia (any one)	½
d)	The non combatants / the common man / politicians / people who sent them to war (any one)	1
e)	No	½
	This is the opinion of the noncombatants	½
	They are unaware of the horrors of trench warfare and mistakenly believe that the injured soldiers are eager to return to the battlefield	1

OPTION (2) CURTAIN

a) The separation/end of the relationship of the two lovers is the quiet disaster /   1

poetic device- unusual collocation / oxymoron / irony / metaphor (any one)   1

<div align="center">

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</div>

b) The two lovers are the Hamlets   1

They have been called so because like Hamlet they will now exist in their individual lonely worlds and not be able to share their grief with anyone else./

They will talk to themselves (soliloquies) no one to hear them / They will always wonder whether their decision to separate was a wise one. (any 1 reason)   1

c) Quiet disaster-disaster cannot be quiet

white murder-murder leads to bloodshed so it can't be white murder of one kiss / Are born two ghosts- murder can't lead to birth (any 2)   2

Q12. ANSWERS (POETRY)   TOTAL 3×3=9 MARKS

Objectives : to test students' comprehension of poetry - local and global

Marking : Content: 2 marks

Expression: 1 mark

a) It starts with the smell of the black bone tree.

She has shrunk in size- her saris hang loosely / She is no longer as active as she used to be / Her hands are gnarled like an eagle's / feather of a one time wing / (any two)

b) Like the flight of a bird, a good poem symbolizes freedom of thought, rhythm, a wholeness or unity, soaring above the mundane, lifting of spirits / imagination/flight of fancy / creativity (at least 3)

c) They are the bright sun, the wind stirring the grass, the flowing river, the singing of the bird and the blooming of the buds and their perfume that spreads all around.(1 example each of sound, smell and sight.)

d) It has been personified as a young girl / woman

She can be seen sitting either on the granary floor, sound asleep by the half reaped furrow, carrying grains across the brook like a gleaner, watching the oozing of apple juice by the cider-press, (all 4 points)

Q13. ANSWERS (PLAY)   TOTAL 5 MARKS

Objectives : to test the students' ability to comprehend plays, understand character etc.

Marking : Content: 3 marks

Expression: 2 marks

OPTION (1) ALEXANDER

Alexander loved / respected Queen Mother

Perdiccas had gone to Babylon to bring Queen Mother.

Late because rivers were in flood and he did not want to risk her safety

He was surprised to learn that Alexander was breaking camp on his way to conquer India.

Felt it was too early and too cold to go to India yet.

OR

OPTION (2) MONKEY'S PAW

- did not believe in it but curiosity aroused
- forced Sergeant Morris to sell paw to him
- but after the first wish felt the paw turn in hand
- started suspecting powers of paw
- also felt saw faces in fire
- later after son's death started believing in its powers
- tried to stop wife from making second wish on it
- finally used third wish to send his son's spirit to rest in peace

Q14. ANSWERS (FICTION)   **TOTAL 3×3=9 MARKS**

Objective : to test student's ability to comprehend, interpret and evaluate prose texts

Marking: Content: 2 marks
                Expression: 1 mark

a) (probably) become careless about his wealth / allowed someone else to take it / had taken it for granted / become greedy and wanted more and more till it had all become too hard to keep, (any two)

b) The earth / life has become a rundown machine because it is full of pollution, is over populated and losing its natural resources due to over exploitation hence it is no longer in good condition / human life has become too mechanical and people become exhausted and have no time for leisure(not in harmony with nature) (any one)

c) The war and its effect on the people and the environment made Lisa say this. She thought that the soldiers were the real heroes

It was not appropriate to make eloquent speeches in the presence of the dead and the dying. / felt love no longer existed

d)   It refers to human ambition / motive / desire for approval and appreciation / recognition / from fellow men.

becomes dangerous when one wants to be regarded as better, stronger or more intelligent than others / leads to unhealthy competition, (any other similar answer conveying the value points).

Q15.   LONG ANSWERS (FICTION)   **Total 6 marks**

Objectives   :   to test students' ability to comprehend prose
                    texts globally, interpret and evaluate them

Marking   :   Content   3 marks
                    Expression   3 marks

OPTION (1) JUDGEMENT OF PARIS

Note : Marks should be awarded for the student's creativity

Suggested Value Points:
-   Worried about the effect of Robichon's speech on audience
-   Thought of a plan to catch Robichon unaware, disguised as Marquis de Thevenin
-   Wonders whether Robichon will agree to meet him after the performance
-   Do or die situation- last chance to win Suzanne- not going to give up so easily

<div align="center">OR</div>

OPTION (2) ROOM 10'×8'
-   Feelings towards her own mother-in -law
-   Has moved into new house but not excited
-   Daughter-in-law becomes mistress of the house
-   Resents the fact that she has got the house without lifting a finger towards its construction
-   Feelings at being relegated to the room 10'×8'

<div align="center">QUESTION PAPER CODE 212

EXPECTED ANSWERS/VALUE POINTS

SECTION A (READING) 20 MARKS</div>

Al.   READING   DR. ARATHI   TOTAL: 12 MARKS

Objective   :   To identify and understand main parts of the text.

Marking   :   As marked in the question paper. No penalty for mistakes of spelling and grammar. Accept any other answer equivalent in meaning to the answers given below.   9 marks

<div align="center">66</div>

Answers:

Al.l

a. She decided to have the child because Dr. Arathi told her that her sister who was childless would adopt the child   1

and give her money for it   1

b. Because of her feelings of attachment /mother's love   1
It was tiny and dependent   1

c. She had not expected her to say that she did not like her lecture / she was taken aback by Meera's comment that life was not like that   1

d. Because they were too poor to treat her blindness   1
so they just abandoned her at the bus stop   1

e. Meera had glorified motherhood   1
Manjula's experience with her own mother had shown her that poverty could force a mother to forsake her child / that poverty is more powerful than motherhood.   1

A1.2 VOCABULARY

Objective : To deduce the opposites of words / phrases

Marking : 1 mark each

Answers :   3 marks
(i)   tiny
(ii)   fiction
(iii)   expensive

A.2 NOTE MAKING AND SUMMARIZING   TOTAL: 8 MARKS

Objective : To develop the skill of taking down notes
To develop the extracted ideas into a sustained piece of writing.

Marking :	**Note making**	5 marks
	Heading and indentation	½ + ½ mark
	Abbreviations / Symbols	1 mark
	(with or without key,	
	minimum four)	
	Content	3 marks
	(minimum three sub headings)	

Important Instructions:

The notes provided below are only guidelines. Any other title, main points and sub points should be accepted if they are indicative of the students' understanding of the given passage and the notes include the main points with suitable and recognizable abbreviations.

Complete sentences should not be accepted as notes. Half a mark should be deducted from the total if the student writes complete sentences.

Numbering of points can be indicated in different ways and these should be accepted as long as a consistent pattern.

A 2.1   Note making

Note   :   if the student has attempted only the summary or only the notes, due credit should be given.

Suggested Notes

Heading - <u>The World of Feathers</u> (or similar heading)

I   Features
   1.   soft,
   2.   splendid array of
        i.   colours
              a.   crow- ebony
              b.   canary- bright yellow
              c.   parrot- green
              d.   used as cmflge
        ii.   shapes
        iii. sizes
   3.   light
   4.   resilient
   5.   strong
   6.   nature's finest marvels

II.   Shapes and Functions
   1.   flight feathers on wings straight & stiff
   2.   feathers covering body overlap giving
        i.   aerodynamic shape for efficient flight
        ii.   snug jacket keeping out wind, water & cold
   3.   tail feathers—lifting/ steering/ braking/ balanced flight

III. Methods of Cleaning & Grooming
   1.   spend large part of day in this
   2.   apply oil
   3.   bathe in water or dust
   4.   scratch and preen to
        i.   straighten feathers

IV. Process of molting

    1. replacement of old feathers with new

    2. takes place one or more times a yr

    3. no. varies from 25,000-1,000

V. Feathers and Humans

    1. worn by tribals in

        i. Africa,

        ii. Asia,

        iii . Australia

        iv. Red Indians-headdress

    2. Greek mythology-Daedalus attached feathered wings

    3. used in

        i   beddings

        ii. pillows

VI. Composition —made of keratin

Suggested Abbreviations:

1. cmflge- camouflage

2. &-and

3. yr-year

4. 25,000-1,000-twenty five thousand to one thousand

5. any other

A2.2 **SUMMARY**

Marking : Content   2 marks

                Expression   1 mark

Note : Considering the numerous facts mentioned in the notes about the world of feathers, due consideration should be given to the students if they do not cover all the points in the summary which is accepted to be concise. The summary should cover the essential details only.

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SECTION B: WRITING   **TOTAL: 30 MARKS**

</div>

Q.3. **INVITATION CARD**   **TOTAL: 5 MARKS**

Objectives : To write in an appropriate style for writing an invitation card

Marking :

        Layout   1 mark

        (centrally aligned and placed in a box)

        Content   2 marks

        Expression   2 marks

Suggested Value Points

- issuing authority- Danapur National School, Patna/Principal, Staff and Students
- event - celebrating Sports Day
- on the 24th of March / time / venue
- Mr. Rohit David-Chief Guest
- R.S.V.P

Q.4. **NOTICE**   **TOTAL: 5 MARKS**

Objective : To write in an appropriate style and format of a notice

Marking : Format   1 mark
  (mention of the word Notice,
  issuing authority, heading,
  date of issue, signatory and designation)
  Content   3 marks
  Expression   1 mark

Suggested Value Points:

- collection of old clothes / books /toys being organized for the poor children of the locality
- date of submission
- venue
- other relevant information

Q.5. **LETTER TO THE EDITOR**   **TOTAL: 10 MARKS**
  OPTION (1)

Objective   : To use an appropriate style to write a formal letter.
  To plan, organize and present ideas coherently.

Marking   :
  Format   2 marks
  (1. sender's address, 2. addressee's address,
  3. date, 4.subject, 5. salutation, 6.complimentary close
  7. sender's signature / name)
  Content   4 marks
  Expression   4 marks
  (2 marks for fluency 2 marks for accuracy)

Suggested Value Points

- mention newspapers printing objectionable photographs of female athletes / sportspersons / other women / male dominated society
- primary aim — to increase circulation of newspaper
- less coverage to achievements and quality work done
- mention effects of such irresponsible reporting on players / readers
- suggestions on how to deal with this problem
- other relevant information

OPTION (2)

COMPLAINT LETTER   **TOTAL: 10 MARKS**

Objectives : To use an appropriate style to write a formal letter. To plan, organize and present ideas coherently.

Marking   :

Format	2 marks
(1. sender's address, 2. addressee's address,	
3. date, 4.subject, 5. salutation, 6. complimentary close,	
7. sender's signature / name)	
Content	4 marks
Expression	4 marks
(2 marks for fluency; 2 marks for accuracy)	

Suggested Value Points

- recently bought a new colour TV
- receipt number / date of purchase- warranty
- upset because the set is not functioning properly-defects
- asking for a replacement of the set

Q6.   ARTICLE— SAVING ENDANGERED ANIMALS   TOTAL: 10 MARKS

OPTION (1)

Objective   : To write in an appropriate style required for an article

To plan / organize and present ideas coherently.

To transcode / analyse given information and arrive at conclusions.

Marking   :

Format: Title and writer's name	1 mark
Content: Credit should be given for the	4 marks
candidate's creativity in presenting	
his / her ideas. However, the points given	
below may be included.	

Expression :   5 marks
        Fluency (2½ marks)
        Accuracy (2½ marks)

Suggested Value Points:

- both people and tigers should coexist

- consequences of meddling — if one destroyed, other will be affected too

- protection of interests of people living in tiger reserves

- suggestions on how to conserve environment and save the animals especially endangered

<div align="center">

OR

</div>

OPTION (2)

SPEECH — CAPITAL PUNISHMENT   **TOTAL: 10 MARKS**

Objective : To write in an appropriate style required for a speech
        To plan / organize and present ideas coherently.
        To transcode / analyse given information and arrive at
        conclusions.

Marking :

        Format: Introduction of speech and appropriate ending.   1 mark
        Content: Credit should be given for the candidate's
        creativity in presenting his/her ideas. However, the
        points given below may be included   4 marks

Expression: 5 marks
        Fluency (2½ marks)
        Accuracy (2½ marks)

Suggested Value Points

- wisdom of retaining death penalty

- either in support or against this form of punishment

- **for —** acts as deterrent

- removes threat

- safer society

- **<u>against</u> —** innocent can be killed

- killing not affected crime rate

- no chance of reformation

         TOTAL: 15 MARKS

Q7.   **REARRANGING**   **TOTAL: 3 MARKS**

Objectives **:**   To be able to present ideas in grammatically logical sequence.

Marking **:**   For every correct answer.   ½ mark
Award marks to the answer written in point form or paragraph

<u>Answer</u>

a) Farmers have been faced with the problem of bringing water to dry lands from the earliest times.

b) When men started farming crops in the Nile Valley in Egypt, they seemed to have perfect conditions for farming.

c) But the Nile did not flow evenly throughout the year.

d) In summer it caused great floods, washing away precious soil.

e) While in winter the fields were dry and dusty and there was no water.

f) Therefore the Egyptians learnt how to control water and irrigate their lands

Q8.   **EDITING**   **TOTAL: 5 MARKS**

Objectives **:**   to use grammatical items appropriately

Marking **:**   ½ mark each   Total 5 marks

Note: If the candidate copies the sentence and replaces the incorrect word with the correct answer / writes only the corrected words, marks should be awarded.

	<u>Incorrect</u>	<u>Correct</u>
a)	in	on
b)	would	can/might
c)	are	is
d)	was	is
e)	who	which/that
f)	it's	its
g)	feather	feathers
h)	or	and
i)	the / great	a / greatest
j)	in	with

Q9. **FRAMING QUESTIONS**   **TOTAL: 4 MARKS**

Objectives : to understand the context and frame relevant and appropriate
question

Marking : 1 mark each for every accurate question framed

Note: No marks to be awarded if there is any inaccuracy. The eight questions
should cover at least any of the two areas specified for the interview in the
given question.

Sample Questions:
a) What kind of families do they have?
b) How do they spend their weekends?
c) What kind of entertainment do they have?
d) What kind of lifestyle do they have?
e) What kind of food do they enjoy?
f) How often do they travel?
g) What kind of clothes do they wear?
h) Do they spend a lot of time with their friends?

Q10. **DIALOGUE WRITING**   **TOTAL: 3 MARKS**

Objectives : To be able to extend a situation into a meaningful dialogue.

Marking : ½ mark each for every correct dialogue provided it is accurately
and appropriately expressed. No mark should be awarded if
there is any inaccuracy.

This includes inaccuracies in grammar, spelling or
punctuation.   3 marks

Sample Answers :

Shyam   : Good morning sir, I am Shyam.

Principal : Good morning Mr.Shyam, I see you are interested in joining the school
as a PT teacher. What are your qualifications?

Shyam   : I have obtained a Masters degree in Physical Education, Sir.

Principal : Have you worked in any other school?

Shyam   : Yes Sir, I have an experience of about 12 years, out of which six years
were at a boarding school.

Principal : Have you specialized in any particular game?

Shyam   : Yes, I have played basketball at the national level.

Principal : Have you won any prizes?

Shyam   : Yes, I was adjudged the best young basketball player in college and
was a member of the national team for five years.

Q11.   REFERENCE TO CONTEXT   6 MARKS

   Objective   :   To test students' comprehension of poetry—local, global,
                      interpretative, inferential and evaluative

   Marking   :   6 marks

   Answers   :

   OPTION (1) OF MOTHER'S, AMONG OTHER THINGS

   a)   Of Mother's, Among Other Things; AK Ramanujan   ½ + ½

   b)   It refers to the old mother.   1

   c)   It refers to the silk clothes and white flowers that the mother wore in her
        youth   1
        as also the softness of the young mother's skin   1

   a)   The wrinkled hands, the crippled fingers, the loss of mobility, reduced in
        size —feather of a one time wing   ½ × 4 = 2

                              Or

   OPTION (2) ODE TO AUTUMN

   a)   Ode to Autumn; John Keats   ½ + ½

   b)   Autumn   1

   c)   The sounds that can be heard during autumn; the wailful mourn of the
        gnats; loud bleating of the lambs; singing of the cricket; the whistling of
        the red breasts; and the twittering of the swallows. (any 2)   1+1

   d)   It refers to the plains that have been freshly harvested   1

   e)   The picture of the end of a day / of freshly cut fields, that is coloured by the
        light of the soft glow of the setting sun.   1

Q12.   ANSWERS (POETRY)   TOTAL 3×3=9 MARKS

   Objectives   :   To test students' comprehension of poetry - local and global

   Marking   :
                         Content: 2 marks
                         Expression: 1 mark

   a)   Through the bird's captivity, the poem conveys the feelings of those in bondage

        / the oppressed Afro-Americans, and the poet's empathy for them and his
        understanding and total identification with the pain and suffering of such people.

   b)   Curtain-symbol of separation
        Poem talks about two lovers parting ways

c) The father sells cabbage nets while the mother sells lace; She has to wait because the man she loves is an apprentice and cannot marry before seven years / he is under contract for seven years.

d) A good poem is symbolic and suggestive; it uses concrete objects to convey abstract thoughts; it conveys feelings; (any other 3 similar points from the poem)

Q13.   ANSWERS (PLAY)   TOTAL: 5 MARKS

Objectives :   To test the students' ability to comprehend plays, understand character etc.

Marking :

Content: 3 marks

Expression: 2 marks

OPTION (1) ALEXANDER

Alexander's character

- He is an adventurer- loves conquering lands- ambitious, brave

- He is restless, needs action / is happy when he is doing rather than thinking, wants to be remembered for what he does and not for what he is

- He is sensitive, emotional, impulsive—winning Queen mother's approval is important / throws away Parmenion's locket

- He leads by example—burns his throne and his own belongings before expecting his soldiers to follow his orders

- Or any other relevant points substantiated with examples from the text

OR

OPTION (2) MONKEY'S PAW

They get the paw from Sergeant Morris, a family friend. Initial reaction skeptical / curious—later on lose their son —hence not happy

Q14.   ANSWERS (FICTION)   TOTAL 3×3=9 MARKS

Objective :   To test students' ability to comprehend, interpret and evaluate prose texts

Marking :

Content: 2 marks

Expression: 1 mark

(a) -   When Suzanne lays the condition of her marriage.

-    Says she would marry the one who is judged to be the better actor of the two by the people of Paris.

-    The two actors equally good, hence it would be impossible to decide the contest.

(b) According to Einstein true education should aim at

- training independently acting,
- and thinking individuals, who see in
- the service of the community their highest goal,

(c) - Officers appointed by Asoka to help the spread of law of piety,
- they had to ensure the welfare and happiness of the people
- as also the people living on the borders and other nations.
- to prevent wrongful imprisonment and help those in need

(d) - Mr. Malik had been transferred to Delhi
- had a plot of land, so decided to build house.
- to prevent disturbance in studies of children caused by regular transfers.

Q15. LONG ANSWERS (FICTION)   TOTAL: 6 MARKS

Objectives : To test students' ability to comprehend prose texts globally, interpret and evaluate them.

Marking :

Content	3 marks
Expression	3 marks

OPTION (1) THE ACTRESS

Suggested Value Points :

- passionate about acting but something lacking
- Experiences at the front
- Audience reaction from mechanical to wild
- Loss of Doronin
- change from earlier performances—pain made her understand the emotions that she was enacting
- transformed into a great actress

OPTION (2) GRIEF

Suggested Value Points:

- Missing daughter
- People in city cold and emotionless
- Tried sharing grief with passengers (give 2 examples)-but they did not listen
- Missing son
- Grief unbearable, finally unburdened to horse

MATHEMATICS

Time allowed : 3 hours   *Maximum Marks : 100*

General Instructions :

(i) *The question paper consists of three sections A, B and C.* **Section A is compulsory** *for all students. In addition to Section A, every student has to attempt* **either Section B OR Section C.**

(ii) **For Section A**

Question numbers 1 to 8 are of 3 marks each.

Question numbers 9 to 15 are of 4 marks each.

Question numbers 16 to 18 are of 6 marks each.

(iii) **For Section B/Section C**

Question numbers 19 to 22 are of 3 marks each.

Question numbers 23 to 25 are of 4 marks each.

Question number 26 is of 6 marks.

(iv) *All questions are compulsory.*

(v) *Internal choices have been provided in some questions. You have to attempt only one of the choices in such questions.*

(vi) *Use of calculator is not permitted. However, you may ask for logarithmic and statistical tables, if required.*

QUESTION PAPER CODE 65/1/1

SECTION — A

1. Express the following matrix as the sum of a symmertic and a skew symmetric matrix :

$$\begin{bmatrix} 1 & 3 & 5 \\ -6 & 8 & 3 \\ -4 & 6 & 5 \end{bmatrix}$$

2. Using properties of determinants, prove the following :

$$\begin{vmatrix} a & b & c \\ a-b & b-c & c-a \\ b+c & c+a & a+b \end{vmatrix} = a^3 + b^3 + c^3 - 3abc$$

3. Solve the following differential equation :

$$\frac{dy}{dx} - \frac{y}{x} = 2x^2$$

4. Form the differential equation of the family of curves y = a sin (x + b), where a and b are arbitrary constants.

OR

Solve the following differential equation :

$$2\,xydx + (x^2 + 2y^2)\,dy = 0$$

5. Evaluate :

$$\int \frac{dx}{\sqrt{x^2 - 3x + 2}}$$

6. Evaluate :

$$\int \frac{\sin\,(x - \alpha)}{\sin\,(x + \alpha)}\,dx$$

7. Two dice are rolled once. Find the probability that :

(i) the numbers on two dice are different

(ii) the total of numbers on the two dice is at least 4

8. A pair of dice is tossed twice. If the random variable X is defined as the number of doublets, find the probability distribution of X.

9. Examine the validity of the following argument :

$$s_1 : pvq; \ s_2 : \sim p; \ s : \sim q$$

OR

Construct an input/output table of the following circuit :
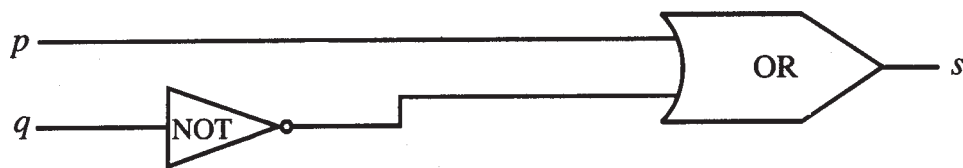
10. Differentiate sin (2x + 3) w.r.t. x from first principle.

11. If $y = \sqrt{\dfrac{(x-3)(x^2+4)}{3x^2+4x+5}}$, find $\dfrac{dy}{dx}$

12. Evaluate :

$$\int_0^{\frac{\pi}{4}} \sin 2x \sin 3x \, dx$$

OR

Evaluate :

$$\int_0^{\frac{\pi}{4}} \log (1 + \tan x) \, dx$$

13. Evaluate :

$$\int \frac{3x+1}{2x^2-2x+3} dx$$

14. Evaluate :

$$\lim_{x \to \frac{\pi}{6}} \left[\frac{\sqrt{3}\sin x - \cos x}{x - \dfrac{\pi}{6}} \right]$$

15. Verify Rolle's Theorem for the following function :

$$f(x) = (x-1)(x-2)^2, [1, 2]$$

16. Using matrices, solve the following system of equations :
$$x + y + z = 3; x - 2y + 3z = 2 \quad \text{and} \quad 2x - y + z = 2$$

17. Find the point on the curve $y^2 = 4x$ which is nearest to the point $(2, -8)$.

OR

Prove that the height of a right circular cylinder of maximum volume that can be

inscribed in a sphere of radius R is $\dfrac{2R}{\sqrt{3}}$. Also find the maximum volume.

18. Find the area of the region bounded by $y^2 = 4x$, $x = 1$, $x = 4$ and x-axis in the first quadrant.

OR

Evaluate $\int\limits_0^2 (x^2 + x + 1)\,dx$ as limit of a sum.

SECTION — B

19. If $\vec{a} = \hat{i} + 2\hat{j} - 3\hat{k}, \vec{b} = 3\hat{i} - \hat{j} + 2\hat{k}$, show that $\left(\vec{a} + \vec{b}\right)$ and $\left(\vec{a} - \vec{b}\right)$ are perpendicular to each other.

20. Using vectors prove that the line segment joining the mid-points of non-parallel sides of a trapezium is parallel to the base and is equal to half the sum of the parallel sides.

21. A body, moving with a velocity of 36 km/hour, is brought to rest in 10 seconds. Find the retardation and the distance travelled by the body before coming to rest.

22. A particle is projected so as to graze the tops of two walls, each of height 10 m at 15 m and 45 m respectively from the point of projection. Find the angle of projection.

OR

P, Q, R, S are points in a vertical line so that P is the highest and PQ = QR = RS. If a body falls from rest at P, prove that the times of describing the successive intervals are in the ratio $1 : \sqrt{2} - 1 : \sqrt{3} - \sqrt{2}$.

23. ABC is a given triangle in which forces $\vec{P}, \vec{Q}$ and $\vec{R}$ act along OA, OB and OC, where O is the incentre of the triangle, are in equilibrium. Prove that

$$\frac{P}{\cos\dfrac{A}{2}} = \frac{Q}{\cos\dfrac{B}{2}} = \frac{R}{\cos\dfrac{C}{2}}$$

24. Two like parallel forces $\vec{P}$ and $\vec{Q}$ act on a rigid body at A and B respectively. If $\vec{P}$ and $\vec{Q}$ are interchanged in position, show that the point of application of the resultant will be displaced through a distance $\dfrac{P - Q}{P + Q}.AB.$

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25. Find the equation of the plane passing through the points $(1, 2, 3)$ and $(0, -1, 0)$ and parallel to the line $\dfrac{x-1}{2} = \dfrac{y+2}{3} = \dfrac{z}{-3}$

OR

Find the vector and cartesian equations of the sphere described on the join of the points $(2, -3, 4)$ and $(-5, 6, -7)$ as the extremities of a diameter.

26. The vector equations of two lines are :

$$\vec{r} = \hat{i} + 2\hat{j} + 3\hat{k} + \lambda(\hat{i} - 3\hat{j} + 2\hat{k}) \quad \text{and} \quad \vec{r} = 4\hat{i} + 5\hat{j} + 6\hat{k} + \mu(2\hat{i} + 3\hat{j} + \hat{k}).$$

Find the shortest distance between the above lines.

SECTION — C

19. In a factory, which manufactures nuts, machines A, B and C manufacture respectively 25%, 35% and 40% of nuts. Of their outputs, 5, 4 and 2 per cent respectively are defective nuts. A nut is drawn at random from the product and is found to be defective. Find the probability that it is manufactured by machine B.

20. If the mean and variance of a binomial distribution are respectively 9 and 6, find the distribution.

OR

8% of people in a group are left handed. What is the probability that 2 or more of a random sample of 25 from the group are left handed ?

[Use $e^{-2} = 0.135$]

21. What is the face value of a bill discounted at 5% per annum 73 days earlier than its legal due date, the banker's gain being Rs. 10 ?

22. A bill for Rs. 21,900, drawn on July 10, 2005 for 6 months, was discounted for Rs. 21,720 at 5% per annum. On what date was the bill discounted ?

23. A and B are partners sharing profits and losses in the ratio 3 : 4 respectively. They admit C as a new partner, the new profit sharing ratio being 2 : 2 : 3 between A, B and C respectively. C pays Rs. 12,000 as premium for goodwill. Find the amount of premium shared by A and B.

24. Find the present worth of an ordinary annuity of Rs. 1,200 per annum for 10 years at 12% per annum, compounded annually. [Use : $(1.12)^{-10} = 0.3221$]

25. If the total cost function is given by $C = a + bx + cx^2$ where x is the quantity of output, show that

$$\frac{d}{dx}[AC] = \frac{1}{2}[MC - AC]$$

where MC and AC are marginal and average costs respectively.

OR

If the marginal revenue function for a commodity is $MR = 9 - 6x^2 + 2x$, find the total revenue function and the corresponding demand function.

26. A dealer wishes to purchase a number of fans and sewing machines. He has only Rs. 5,760 to invest and has space for at most 20 items. A fan and sewing machine cost Rs. 360 and Rs. 240 respectively. He can sell a fan at a profit of Rs. 22 and sewing machine at a profit of Rs. 18. Assuming that he can sell whatever he buys, how should he invest his money in order to maximise his profit ? Translate the problem into LPP and solve it graphically.

QUESTION PAPER CODE 65/1

SECTION 'A'

1. Express the matrix $A = \begin{bmatrix} 1 & 3 & 5 \\ -6 & 8 & 3 \\ -4 & 6 & 5 \end{bmatrix}$ as the sum of a symmetric and skew symmetric matrix.

2. Using properties of determinants, prove the following :

$$\begin{vmatrix} 3a & -a+b & -a+c \\ a-b & 3b & c-b \\ a-c & b-c & 3c \end{vmatrix} = 3(a+b+c)(ab+bc+ca)$$

3. Solve the following differential equation :

$$\sin x \frac{dy}{dx} + \cos x.y = \cos x. \sin^2 x$$

4. Verify that $y = A\cos x - b\sin x$ is a solution of the differential equation

$$\frac{d^2 y}{dx^2} + y = 0.$$

OR

Solve the following differential equation :

$$(y^2 - x^2)dy = 3xy\, dx$$

5. Evaluate :

$$\int \frac{x^2 + 1}{(x+1)^2}\, dx$$

OR

Evaluate :

$$\int \frac{dx}{x^3 + x^2 + x + 1}$$

6. Evaluate :

$$\int \frac{2x.\tan-1(x^2)}{1+x^4}\, dx$$

7. Two cards are drawn successively with replacement from a well shuffled pack of 52 cards. Find the probability distribution of number of jacks.

8. A and B toss a coin alternately till one of them gets a head and wins the game. If A starts first, find the probability that B will win the game.

9. Show that the following argument is invalid :

$$s_1 : p \vee q, \quad s_2 :\sim p, \quad s :\sim q$$

OR

Construct an input/output table for the following circuit :
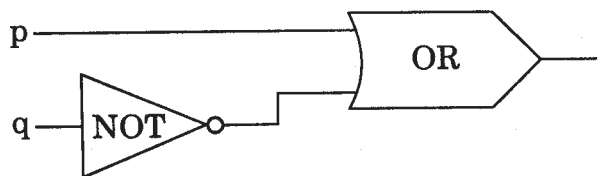
10. Evaluate :

$$\lim_{y \to \infty} \left(\sqrt{x^2 + x + 1} - x \right)$$

11. Differentiate $\sqrt{\tan x}$ w.r.t. x from first principles.

12. If $y = \sqrt{x} + \dfrac{1}{\sqrt{x}}$, show that $2x\dfrac{dy}{dx} + y = 2\sqrt{x}$.

OR

If $y = \tan^{-1}\left[\dfrac{\sqrt{1+x^2} - \sqrt{1-x^2}}{\sqrt{1+x^2} + \sqrt{1-x^2}}\right]$, find $\dfrac{dy}{dx}$

13. Prove that $\displaystyle\int_0^a f(x)dx = \int_0^a f(a-x)dx$.

Hence, evaluate $\displaystyle\int_0^{\pi/2} \dfrac{dx}{1+\tan x}$

14. Evaluate :

$$\int \sqrt{\tan\theta}\, d\theta$$

15. Find the intervals in which the function $f(x) = x^3 - 12x^2 + 36x + 17$ is (a) increasing, (b) decreasing.

16. Using matrices, solve the following system of equations :

$$3x - y + z = 5$$
$$2x - 2y + 3z = 7$$
$$x + y - z = -1$$

17. An open box, with a square base, is to be made out of a given quantity of metal sheet of area C^2. Show that the maximum volume of the box is $\dfrac{C^3}{6\sqrt{3}}$.

OR

A window is in the form of a rectangle surmounted by a semi-circle. If the total perimeter of the window is 30 m, find the dimensions of the window so that maximum light is admitted.

18. Find the area of the region bounded by the parabola $x^2 = 4y$ and the line $x = 4y - 2$.

OR

Evaluate $\displaystyle\int_0^2 (x^2 + x + 2)dx$ as limit of sums.

SECTION B

19. Find the angle between the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ if $\vec{a} = 2\hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} + \hat{j} - 2\hat{k}$.

20. Using vectors, prove that in a Δ ABC,

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Where a, b and c are lengths of the sides opposite, respectively, to the angles A, B and C of $\triangle$ABC.

21. Find the coordinates of the point where the line

$$\frac{x+1}{2} = \frac{y+2}{3} = \frac{z+3}{4}$$

meets the plane $x + y + 4z = 6$.

22. Find the image of the point (1, 2, 3) in the plane $x + 2y + 4z = 38$.

23. Find the radius of the circular section of the sphere $|\vec{r}| = 5$ by the plane $\vec{r} \cdot (\hat{i} + \hat{j} + \hat{k}) = 3\sqrt{3}$.

24. The resultant of two forces $\vec{P}$ and $\vec{Q}$ acting at an angle θ is equal to

$(2m+1)\sqrt{P^2 + Q^2}$ and when they act at a angle $\left(\frac{\pi}{2} - \theta\right)$ the resultant is equal to $(2m-1)\sqrt{P^2 + Q^2}$. Show that

$$\tan\theta = \frac{m-1}{m+1}$$

25. A body of mass 10 kg hangs by a string from a fixed point. The string is drawn out of the vertical by applying a force 49 N to the body. In which direction should this force be applied in order that, in equilibrium, the deflection of the string from the vertical may be 30° ? Also find the tension in the string.

26. A particle is projected so as a graze the tops of two walls, each of height 10 m, at distance 15 m and 45 m respectively from the point of projection. Find the angle of projection.

SECTION C

19.   In a bolt factory, machines A, B, C manufacture 25%, 35% and 40% respectively of the total bolts. Of their output 5%, 4% and 2% respectively are defective bolts. A bolts is drawn at random and is found to be defective. Find the probability that it is manufactured by machine B.

20.   The mean and variance of the binomial distribution are 4 and $\frac{4}{3}$ respectively. Find the distribution and $P(X \geq 1)$.

21.   The banker's discount and banker's gain on a certain bill of exchange, due after a certain time, are respectively Rs. 1,250 and Rs. 50. Find the face value of the bill.

22.   A bill for Rs. 5,050 is drawn on April 13,2005. It is discounted on July 4, 2005 at 5% per annum. If the banker's gain in the transaction is Rs. 0.50, find the nominal date of maturity of the bill.

23.   A machine costs a company Rs. 5,75,000 and its effective life is estimated to be 20 years. A sinking fund is created for replacing the machine at the end of its life-time when its scrap realises a sum of Rs. 75,000 only. Calculate what amount should be provided every year out of profits, for the sinking fund if it accumulates an interest of 5% per annum, compounded annually. [Use $(1.05)^{20} = 2.655$]

24.   A and B are partners sharing profits and losses in the ratio 5:3. C pays Rs. 96,000 as premium for the goodwill of the business and is admitted for $\frac{1}{5}$ th share. Show how this amount will be shared by A and B, assuming that the share of C is contributed by A and B in their profit sharing ratio. Find also the new profit sharing ratio.

25.   The manufacturing cost of an item consists of Rs. 900 as overheads, the mateiral costs Rs. 3 per item and labour cost is Rs. $\frac{x^2}{100}$ for x items produced. How many items must be produced to have minimum average cost ?

26.   David wants to invest at most Rs. 12,000 in Bonds A and B. According to the rule, he has to invest at least Rs. 2,000 in Bond A and at least Rs. 4,000 in Bond B. If the rates of interest on Bonds A and B respectively are 8% and 10% per annum, formulate the problem as L.P.P. and solve it graphically for maximum interest. Also determine the maximum interest received in a year.

Marking Scheme ---- Mathematics

General Instructions :

1. The Marking Scheme provides general guidelines to reduce subjectivity in the marking. The answers given in the Marking Scheme are suggested answers. The content is thus indicative. If a student has given any other answer which is different from the one given in the Marking Scheme, but conveys the meaning, such answers should be given full weightage.

2. Evaluation is to be done as per instructions provided in the marking scheme. It should not be done according to one's own interpretation or any other consideration — Marking Scheme should be strictly adhered to and religiously followed.

3. Alternative methods are accepted. Proportional marks are to be awarded.

4. Marks may not be deducted in questions on integration if constant of integration is not written.

5. In question(s) on differential equations, constant of integration has to be written.

6. If a candidate has attempted a question twice, marks obtained in the question attempted first should be retained and the other answer should be scored out.

7. A full scale of marks - 0 to 100 has to be used. Please do not hesitate to award full marks if the answer deserves it.

EXPECTED ANSWERS/VALUE POINTS

SECTION 'A'

1. $A = \begin{bmatrix} 1 & 3 & 5 \\ -6 & 8 & 3 \\ -4 & 6 & 5 \end{bmatrix} \Rightarrow A' = \begin{bmatrix} 1 & -6 & -4 \\ 3 & 8 & 6 \\ 5 & 3 & 5 \end{bmatrix}$ 1 m

$\therefore \dfrac{A + A'}{2} = \begin{bmatrix} 1 & -\dfrac{3}{2} & \dfrac{1}{2} \\ -\dfrac{3}{2} & 8 & \dfrac{9}{2} \\ \dfrac{1}{2} & \dfrac{9}{2} & 5 \end{bmatrix}$

1 m

$\dfrac{A - A'}{2} = \begin{bmatrix} 0 & \dfrac{9}{2} & \dfrac{9}{2} \\ -\dfrac{9}{2} & 0 & -\dfrac{3}{2} \\ -\dfrac{9}{2} & \dfrac{3}{2} & 0 \end{bmatrix}$

½ m

$\therefore \quad A = \begin{bmatrix} 1 & -\dfrac{3}{2} & \dfrac{1}{2} \\ -\dfrac{3}{2} & 8 & \dfrac{9}{2} \\ \dfrac{1}{2} & \dfrac{9}{2} & 5 \end{bmatrix} + \begin{bmatrix} 0 & \dfrac{9}{2} & \dfrac{9}{2} \\ -\dfrac{9}{2} & 0 & -\dfrac{3}{2} \\ -\dfrac{9}{2} & \dfrac{3}{2} & 0 \end{bmatrix}$ First is symmetric and the other skew-symmetric $\Big\}$

½ m

2. $\Delta = \begin{vmatrix} a & b & c \\ a-b & b-c & c-a \\ b+c & c+a & a+b \end{vmatrix}$

$C_1 \to C_1 + C_2 + C_3 \Rightarrow \Delta = \begin{vmatrix} a+b+c & b & c \\ 0 & b-c & c-a \\ 2(a+b+c) & c+a & a+b \end{vmatrix}$ 1 m

$$\therefore \quad \Delta = (a+b+c) \begin{vmatrix} 1 & b & c \\ 0 & b-c & c-a \\ 2 & c+a & a+b \end{vmatrix}$$

½ m

$$R_3 \rightarrow R_3 - 2R_1 \Rightarrow \quad \Delta = (a+b+c) \begin{vmatrix} 1 & b & c \\ 0 & b-c & c-a \\ 0 & c+a-2b & a+b-2c \end{vmatrix}$$

½ m

$$= (a+b+c)\left[(b-c)(a+b-2c) - (c+a-2b)(c-a)\right]$$

$$= (a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca)$$

$$= a^3 + b^3 + c^3 - 3abc$$

1 m

3. Integrating factor $= e^{-\int \frac{dx}{x}} = e^{-\log x} = \dfrac{1}{x}$

1 m

The solution of differential equation is

$$y.\frac{1}{x} = \int \frac{2x^2}{x}\, dx + c$$

1 m

$$y.\frac{1}{x} = x^2 + c \quad \text{or} \quad y = x^3 + cx$$

1 m

4. $y = a \sin(x+b)$

$$\therefore \quad \frac{dy}{dx} = a \cos(x+b)$$

1 m

$$\frac{d^2 y}{dx^2} = -a \sin(x+b) = -y$$

1 m

$$\therefore \quad \frac{d^2 y}{dx^2} + y = 0$$

1 m

OR

$$\frac{dy}{dx} = \frac{-2xy}{x^2 + 2y^2} \quad ; \quad \text{Let} \quad y = vx \implies \frac{dy}{dx} = v + x\frac{dv}{dx}$$

½ m

$$\therefore \quad v + x\frac{dv}{dx} = \frac{-2vx^2}{x^2 + 2v^2x^2} = \frac{-2v}{1 + 2v^2}$$

$$\therefore \quad x\frac{dv}{dx} = \frac{-2v - v - 2v^3}{1 + 2v^2} = -\frac{2v^3 + 3v}{1 + 2v^2}$$

$$\therefore \quad \frac{dx}{x} = -\frac{1 + 2v^2}{(2v^2 + 3)v}$$

½ m

$$= -\left[\frac{2v^2 + 3 - 2}{v(2v^2 + 3)}\right]dv = \frac{-dv}{v} + \frac{2dv}{v(2v^2 + 3)}$$

$$\therefore \quad \frac{dx}{x} = \frac{-dv}{v} + \left[\frac{A}{v} + \frac{Bv + C}{2v^2 + 3}\right]dv$$

$$A = \frac{2}{3}, \quad B = -\frac{4}{3}, \quad C = 0$$

½ m

$$\therefore \quad \frac{dx}{x} = -\frac{dv}{v} + \frac{2}{3}\frac{dv}{v} - \frac{1}{3}\frac{4vdv}{2v^2 + 3}$$

Intergrating, we get

$$\log x = -\log v + \frac{2}{3}\log v - \frac{1}{3}\log(2v^2 + 3) + \log c$$

½ m

$$= -\frac{1}{3}\log v - \frac{1}{3}\log(2v^2 + 3) + \log c$$

or $\quad \log x^{-3} = \log cv(2v^2 + 3)$

½ m

or $\quad \dfrac{1}{x^3} = c.\dfrac{y}{x}\left(\dfrac{2y^2}{x^2} + 3\right)$

$$= cy\left(\frac{2y^2}{x^3} + \frac{3x^2}{x^3}\right) \quad \text{or} \quad cy(2y^2 + 3x^2) = 1$$

½ m

5. $\displaystyle\int\frac{dx}{\sqrt{x^2-3x+2}} = \int\frac{dx}{\sqrt{\left(x-\frac{3}{2}\right)^2-\left(\frac{1}{2}\right)^2}}$ 1½ m

$\displaystyle = \log\left|\left(x-\frac{3}{2}\right)+\sqrt{x^2-3x+2}\right|+c$ 1½ m

6. $\displaystyle I = \int\frac{\sin\{(x+\alpha)-2\alpha\}}{\sin(x+\alpha)}dx$ 1 m

$\displaystyle = \int\frac{\sin(x+\alpha).\cos 2\alpha-\cos(x+\alpha).\sin 2\alpha}{\sin(x+\alpha)}dx$ ½ m

$\displaystyle = \cos 2\alpha\int dx - \sin 2\alpha\int\frac{\cos(x+\alpha)}{\sin(x+\alpha)}dx$ ½ m

$\displaystyle = x\cos 2\alpha - \sin 2\alpha\log\left|\sin(x+\alpha)\right|+c$ 1 m

7. (i) P(Numbers on two dice are different) $= \dfrac{30}{36} = \dfrac{5}{6}$ 1½ m

(ii) P (Total of numbers on two dice is atleast 4) $= \dfrac{33}{36} = \dfrac{11}{12}$ 1½ m

8. Let x denote the number of doublets. Possible doublets are

$(1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)$

Clearly X can take values 0, 1, 2

Probability of

(i) getting a doublet $= \dfrac{1}{6}$ 1 m

(ii) not getting a doublet $= 1-\dfrac{1}{6} = \dfrac{5}{6}$

$P(X=0) = P\text{ (no doublets) } = \dfrac{5}{6}\times\dfrac{5}{6} = \dfrac{25}{36}$ ½ m

$P(X = 1) = P$ (one doublet and one not doublet) $= 2 \cdot \dfrac{1}{6} \cdot \dfrac{5}{6} = \dfrac{10}{36}$ ½ m

$P(X = 2) = P$ (both doublets) $= \dfrac{1}{6} \cdot \dfrac{1}{6} = \dfrac{1}{36}$ ½ m

∴ Required probability distribution is

X	0	1	2
P(X)	$\dfrac{25}{36}$	$\dfrac{10}{36}$	$\dfrac{1}{36}$

½ m

9.   The truth table for the problem is given below :

		Hypotheses		Conclusion	
p	q	$p \vee q$	~ p	~ q	
T	T	T	F	F	
T	F	T	F	T	
F	T	T	T	F	← Critical Row
F	F	F	T	T	

Correct
Truth Table : .. 2½ m

1 m

Conclusion shows F in the only critical row. Hence the given
argument is invalid   ½ m

OR

The input / output table for the given circuit is given below :

Input		Output
p	q	s
1	1	1
1	0	1
0	1	0
0	0	1

Input ....   1+1 m
Output .....   2 m

10. $y = \sin(2x + 3)$

$y + \Delta y = \sin(2x + 2\Delta x + 3)$

$\therefore \quad \Delta y = \sin(2x + 2\Delta x + 3) - \sin(2x + 3)$ 1 m

$= 2\cos(2x + 3 + \Delta x).\sin \Delta x$ 1 m

$\therefore \quad \lim_{\Delta x \to 0} \dfrac{\Delta y}{\Delta x} = \lim_{\Delta x \to 0} 2\cos(2x + 3 + \Delta x). \lim_{\Delta x \to 0} \dfrac{\sin \Delta x}{\Delta x}$ 1 m

or $\quad \dfrac{dy}{dx} = 2\cos(2x + 3).1 = 2\cos(2x + 3)$ 1 m

11. $y = \sqrt{\dfrac{(x - 3)(x^2 + 4)}{3x^2 + 4x + 5}}$ .... (i)

Taking log of both sides of (i), we get

$\log y = \dfrac{1}{2}\left[\log(x - 3) + \log(x^2 + 4) - \log(3x^2 + 4x + 5)\right]$ 1 m

$\therefore \quad \dfrac{1}{y}\dfrac{dy}{dx} = \dfrac{1}{2}\left[\dfrac{1}{x - 3} + \dfrac{2x}{x^2 + 4} - \dfrac{6x + 4}{3x^2 + 4x + 5}\right]$ 2 m

$\therefore \quad \dfrac{dy}{dx} = \dfrac{y}{2}\left[\dfrac{1}{x - 3} + \dfrac{2x}{x^2 + 4} - \dfrac{6x + 4}{3x^2 + 4x + 5}\right]$ 1 m

or $\quad \dfrac{1}{2}\sqrt{\dfrac{(x - 3)(x^2 + 4)}{3x^2 + 4x + 5}}\left[\dfrac{1}{x - 3} + \dfrac{2x}{x^2 + 4} - \dfrac{6x + 4}{3x^2 + 4x + 5}\right]$

12. $\displaystyle\int_0^{\frac{\pi}{4}} \sin 2x.\sin 3x \, dx$

$= \dfrac{1}{2}\displaystyle\int_0^{\frac{\pi}{4}} (\cos x - \cos 5x) \, dx$ 1 m

$= \dfrac{1}{2}\left[\sin x - \dfrac{\sin 5x}{5}\right]_0^{\frac{\pi}{4}}$ 1 m

$= \dfrac{1}{2}\left[\dfrac{1}{\sqrt{2}} + \dfrac{1}{5}.\dfrac{1}{\sqrt{2}}\right] = \dfrac{1}{2}\left[\dfrac{5 + 1}{5\sqrt{2}}\right] = \dfrac{3}{5\sqrt{2}}$ $(1+1) = 2$ m

OR

$$I = \int_0^{\frac{\pi}{4}} \log(1 + \tan x)\, dx$$

Using $\int_0^a f(x)\, dx = \int_0^a f(a-x)\, dx$, we get   ½ m

$$I = \int_0^{\frac{\pi}{4}} \log\left[1 + \tan\left(\frac{\pi}{4} - x\right)\right] dx$$ ½ m

$$= \int_0^{\frac{\pi}{4}} \log\left[1 + \frac{1 - \tan x}{1 + \tan x}\right] dx = \int_0^{\frac{\pi}{4}} [\log 2 - \log(1 + \tan x)]\, dx$$ 1 m

$$\therefore\ 2I = \left[\int_0^{\frac{\pi}{4}} \log 2 \cdot dx\right] \implies I = \frac{\pi}{8} \log 2$$ (1+1) = 2 m

13. $$\int \frac{3x + 1}{2x^2 - 2x + 3} = \int \frac{\frac{3}{4}(4x - 2) + \frac{5}{2}}{2x^2 - 2x + 3}\, dx$$ ½ m

$$= \frac{3}{4} \int \frac{(4x - 2)\, dx}{2x^2 - 2x + 3} + \frac{5}{4} \int \frac{dx}{x^2 - x + \frac{3}{2}}$$ ½ m

$$= \frac{3}{4} \log |2x^2 - 2x + 3| + \frac{5}{4} \int \frac{dx}{\left(x - \frac{1}{2}\right)^2 + \left(\frac{\sqrt{5}}{2}\right)^2} + c$$ (1+1) = 2 m

$$= \frac{3}{4} \log |2x^2 - 2x + 3| + \frac{\sqrt{5}}{2} \tan^{-1} \frac{2x - 1}{\sqrt{5}} + c$$ 1 m

14. $\lim\limits_{x\to\frac{\pi}{6}}\left[\dfrac{\sqrt{3}\sin x-\cos x}{x-\dfrac{\pi}{6}}\right]=\lim\limits_{x\to\frac{\pi}{6}}\left[2\left\{\dfrac{\dfrac{\sqrt{3}}{2}\sin x-\dfrac{1}{2}\cos x}{x-\dfrac{\pi}{6}}\right\}\right]$ 1 m

$=\lim\limits_{x\to\frac{\pi}{6}}\left[\dfrac{2\cos\dfrac{\pi}{6}.\sin x-\sin\dfrac{\pi}{6}.\cos x}{x-\dfrac{\pi}{6}}\right]$ 1 m

$=2\lim\limits_{x\to\frac{\pi}{6}}\dfrac{\sin\left(x-\dfrac{\pi}{6}\right)}{\left(x-\dfrac{\pi}{6}\right)}=2.1=2$ (1+1) = 2 m

15. $f(x)=(x-1)(x-2)^2,\quad[1,2]$

The function $f(x)$ is differentiable on $[1,2]$ and so it is continuous on $[1,2]$.

Also $f(1)=f(2)=0$ 1½ m

∴   All conditions of Rolle's Theorem are satisfied

∴ $f'(x)=(x-1)2(x-2)+(x-2)^2$

         $=(x-2)[2x-2+x-2]=(x-2)(3x-4)$ 1 m

∴ $f'(c)=0\Rightarrow c=2$ and $c=\dfrac{4}{3}$ 1 m

As $1<\dfrac{4}{3}<2,$ the Rolle's theorem is verified   ½ m

16.   The system of equations can be written as

$AX=B,\quad$ where $A=\begin{bmatrix}1&1&1\\1&-2&3\\2&1&1\end{bmatrix}, X=\begin{bmatrix}x\\y\\z\end{bmatrix}, B=\begin{bmatrix}3\\2\\2\end{bmatrix}$ 1 m

or $X=A^{-1}B$

$|A|=1(-2+3)-1(1-6)+1(-1+4)=1+5+3=9$ 1 m

$$\text{Adj. A} = \begin{bmatrix} 1 & -2 & 5 \\ 5 & -1 & -2 \\ 3 & 3 & -3 \end{bmatrix} \quad \text{(one mark for every four correct elements)} \qquad \text{2 m}$$

$$\therefore \quad A^{-1} = \frac{1}{9} \begin{bmatrix} 1 & -2 & 5 \\ 5 & -1 & -2 \\ 3 & 3 & -3 \end{bmatrix} \qquad \tfrac{1}{2}\,\text{m}$$

$$\therefore \quad \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \frac{1}{9} \begin{bmatrix} 1 & -2 & 5 \\ 5 & -1 & -2 \\ 3 & 3 & -3 \end{bmatrix} \begin{bmatrix} 3 \\ 2 \\ 2 \end{bmatrix} = \frac{1}{9} \begin{bmatrix} 9 \\ 9 \\ 9 \end{bmatrix}$$

$$= \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} \Rightarrow x = y = z = 1 \qquad\qquad\qquad\qquad 1\tfrac{1}{2}\,\text{m}$$

17.   Let the point be (x_1, y_1). Let its distance from $(2, -8)$ be d   1 m

$$\therefore \quad d^2 = s = (x_1 - 2)^2 + (y_1 + 8)^2 \qquad\qquad \therefore$$

$$\text{Also,} \quad y_1^2 = 4x_1 \Rightarrow x_1 = \frac{y_1^2}{4}$$

$$\therefore \quad s = \left(\frac{y_1^2}{4} - 2\right)^2 + (y_1 + 8)^2 = \frac{y_1^4}{16} + 4 - y_1^2 + y_1^2 + 64 + 16y_1 = \frac{y_1^4}{16} + 16y_1 + 68 \qquad \text{1 m}$$

$$\therefore \quad \frac{ds}{dy_1} = \frac{y_1^3}{4} + 16 \qquad\qquad\qquad\qquad\qquad\qquad \text{1 m}$$

$$\therefore \quad \frac{ds}{dy_1} = 0 \Rightarrow y_1 = -4$$

$$\therefore \quad \frac{d^2 s}{dy_1^2} = \frac{3}{4} y_1^2 = \text{positive at } y_1 = -4 \Rightarrow \text{Minimum}$$
       1 m

When $y_1 = -4, x_1 = 4$ 1 m

     The point is $(4, -4)$ whose distance from the point $(2, -8)$ is minimum   1 m

OR
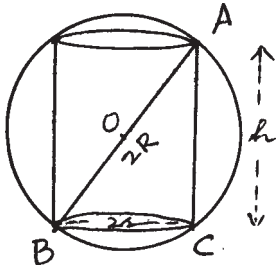
Figure   1 m

In right $\triangle ACB$, $4R^2 = 4r^2 + h^2$

$$\Rightarrow \quad r^2 = \frac{4R^2 - h^2}{4} = R^2 - \frac{h^2}{4}$$ ½

$V=$ Volume of cylinder $= \pi r^2 h = \pi h \left(R^2 - \frac{h^2}{4} \right) = \pi \left(R^2 h - \frac{h^3}{4} \right)$ 1½ m

$$\therefore \quad \frac{dV}{dh} = \pi \left(R^2 - \frac{3h^2}{4} \right)$$ 1 m

$$\frac{dV}{dh} = 0 \implies h^2 = \frac{4R^2}{3} \implies h = \frac{2R}{\sqrt{3}}$$ 1 m

Showing $\dfrac{d^2V}{dh^2}$ is negative $\implies$ maximum

$$\therefore \quad \text{Volume} = \pi \left(R^2 - \frac{h^2}{4} \right) h$$

At $h = \dfrac{2R}{\sqrt{3}}$

Maximum Volume $= \pi . \dfrac{2R}{\sqrt{3}} \left(R^2 - \dfrac{4R^2}{4.3} \right)$

$$= \pi . \frac{2R}{\sqrt{3}} . \frac{2R^2}{3} = \frac{4 \pi R^3}{3\sqrt{3}}$$ 1 m
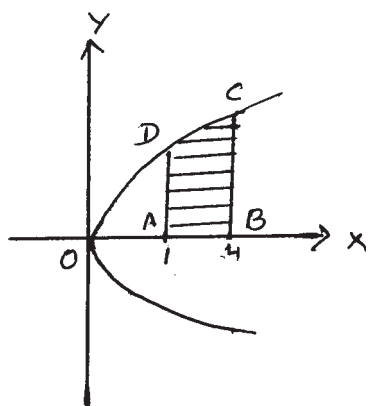
18.   Figure   1 m

The required area of shaded region ABCD is

$$\int_1^4 2\sqrt{x}\ dx$$ 1½ m

$$= 2\left[\frac{x^{\frac{3}{2}}}{\frac{3}{2}}\right]_1^4$$ 1½ m

$$= 2 \times \frac{2}{3}\left[4^{\frac{3}{2}} - 1^{\frac{3}{2}}\right]$$ 1 m

$$= \frac{4}{3}(8-1) = \frac{28}{3} \quad \text{Square units}$$ 1 m

OR

We have to find $I = \int_0^2 (x^2 + x + 1)\ dx$ as limit of a sum

Here $h = \dfrac{2-0}{n} = \dfrac{2}{n}$ ½ m

$I = \lim_{n \to \infty} h[f(0) + f(0+h) + f(0+2h) + \ldots\ldots + f(0 + \overline{n-1}h)]$ 1 m

$$= \lim_{n \to \infty} \frac{2}{n}\left[1 + (h^2 + h + 1) + (4h^2 + 2h + 1) + \ldots\ldots + (n-1)^2 h^2 + (n-1)h + 1\right]$$ 1 m

$$= \lim_{n \to \infty} \frac{2}{n}\left[n + h^2 \cdot \frac{(n-1)n(2n-1)}{6} + h \cdot \frac{(n-1)n}{2}\right]$$ 1 m

$$= \lim_{n \to \infty} \frac{2}{n}\left[n + \frac{4}{6n^2}(n-1)(n)(2n-1) + \frac{(n-1)n}{n}\right]$$ 1½ m

$$= 2\left[1 + \frac{4}{3} + 1\right] = \frac{20}{3}$$ 1 m

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SECTION 'B'

19. $(\vec{a}+\vec{b}) = 4\hat{i} + \hat{j} - \hat{k}$ and $(\vec{a}-\vec{b}) = -2\hat{i} + 3\hat{j} - 5\hat{k}$ 1 m

      For $(\vec{a} + \vec{b})$ and $(\vec{a} - \vec{b})$ to be perpendicular $(\vec{a}+\vec{b}).(\vec{a}-\vec{b}) = 0$ ½ m

      $(\vec{a}+\vec{b}).(\vec{a}-\vec{b}) = 4(-2) + 1.3 + (-1)(-5)$

                        $= -8 + 3 + 5 = 0$ 1 m

      $\therefore$ $(\vec{a}+\vec{b})$ is $\perp$ $(\vec{a}-\vec{b})$ ½ m
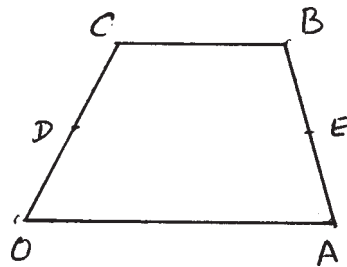
20.   Let $\vec{a}, \vec{b}$ and $\vec{c}$ be the position vectors of A, B and C respectively w.r.t. O. Let D and E be the mid-points of parallel sides OC and AB respectively.   ½ m

      $\therefore$ Positon vector of

                         D is $\dfrac{\vec{O}+\vec{c}}{2} = \dfrac{\vec{c}}{2}$

                                               (½+½)=1 m

                         E is $\dfrac{\vec{a}+\vec{b}}{2}$

                   CB $\|$ OA $\Rightarrow$ $\vec{a} \| \vec{b} - \vec{c}$ ½ m

      $\therefore$ DE $= \dfrac{\vec{a}+\vec{b}}{2} - \dfrac{\vec{c}}{2} = \dfrac{\vec{a}+(\vec{b}-\vec{c})}{2} = \dfrac{OA + CB}{2}$

                                                     1 m

      $\Rightarrow$ E   is parallel to base and its length is half the sum of lengths of the parallel sides.

21. Intial velocity (u) $= 36$ km/hour $= 10$ m/sec.

Final velocity (v) $= 0$ ½ m

t $= 10$ seconds, let a be the accelration

Using $v = u + at$, we get

$0 = 10 + 10a \Rightarrow a = -1$ 1 m

i.e., the retardation is 1 m/sec^2

Let s be the distance travelled before coming to rest

Using $v^2 = u^2 + 2as$, we get ½

$0 = 10^2 - 2s \Rightarrow s = 50$ m 1 m

22.

Let u be the initial velocity, α the angle of projection with the horizontal

$\therefore$ Equation of path is

$$y = x \tan \alpha - \frac{gx^2}{2u^2 \cos^2 \alpha}$$ ½ m

As A and B lie on the curve.

$\therefore$ $10 = 15 \tan \alpha - \dfrac{225g}{2u^2 \cos^2 \alpha}$ .... (i)

$\therefore$ $10 = 45 \tan \alpha - \dfrac{2025g}{2u^2 \cos^2 \alpha}$ .... (ii)

½+½=1m
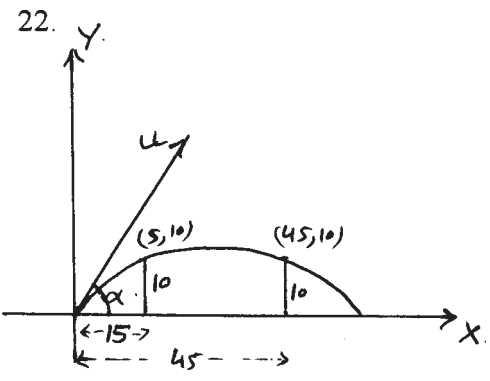
From (i) and (ii)

$$\frac{10 - 15 \tan \alpha}{225} = \frac{10 - 45 \tan \alpha}{2025}$$ ½ m

$\Rightarrow \dfrac{9 \tan \alpha - 2}{3 \tan \alpha - 2} = \dfrac{2025}{225} = 9 \Rightarrow \tan \alpha = \dfrac{8}{9}$

1 m

or $\alpha = \tan^{-1} \left(\dfrac{8}{9} \right)$

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OR

Figure ½ m

As the body starts from rest at P, u = 0. Let t_1, t_2

and   be the times taken to travel from P to Q, P

to R and P to S

$$\therefore \quad s' = \frac{1}{2}at_1^2 \Rightarrow t_1 = \sqrt{\frac{2s'}{a}}$$ ½ m

Similarly , $\quad 2s' = \frac{1}{2}at_2^2 \Rightarrow t_2 = \sqrt{\frac{4s'}{a}}$ ½ m

$$3s' = \frac{1}{2}at_3^2 \Rightarrow t_3 = \sqrt{\frac{6s'}{a}}$$ ½ m

Time taken from Q to R $= t_2 - t_1 = \sqrt{\frac{4s'}{a}} - \sqrt{\frac{2s'}{a}} = \left(\sqrt{2}-1\right)\sqrt{\frac{2s'}{a}}$

Time taken from R to S $= t_3 - t_2 = \sqrt{\frac{6s'}{a}} - \sqrt{\frac{4s'}{a}} = \left(\sqrt{3}-\sqrt{2}\right)\sqrt{\frac{2s'}{a}}$ ½ m

Ratio of times taken to travel successive intervals is

$$1 : (\sqrt{2}-1) : (\sqrt{3}-\sqrt{2})$$ ½ m

23. Figure ½ m

Let O be the centre of the circle and $OD \perp BC$

$$\therefore \quad \angle DOC = 90° - \frac{\angle C}{2}, \angle BOD = 90° - \frac{\angle B}{2}$$

$$\therefore \quad \angle BOC = 180° - \left(\frac{\angle B + \angle C}{2}\right) = 180° - \left(\frac{180° - A}{2}\right)$$ 1 m

$$= 90° + \frac{\angle A}{2}$$

Similarly, $\angle AOC = 90° + \dfrac{\angle B}{2}$ and $\angle AOB = 90° + \dfrac{\angle C}{2}$ 1 m

Applying Lami's Theorem, we get

$$\frac{P}{\sin \angle BOC} = \frac{Q}{\sin \angle COA} = \frac{R}{\sin \angle AOB}$$ 1 m

or $$\frac{P}{\cos \dfrac{A}{2}} = \frac{Q}{\cos \dfrac{B}{2}} = \frac{R}{\cos \dfrac{C}{2}}$$ ½ m

24.
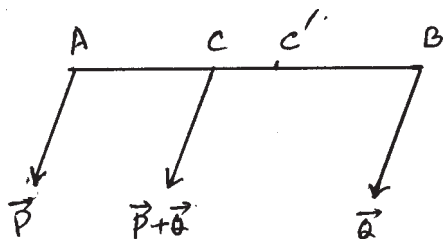
Let the forces $\vec{P}$ and $\vec{Q}$ act at A and B respectively. Let C be the point from where resultant passes

$\therefore$ $$\frac{\vec{P}}{CB} = \frac{\vec{Q}}{AC} = \frac{\vec{P}+\vec{Q}}{AB}$$ 1 m

$\Rightarrow$ $AC = \dfrac{\vec{Q}.AB}{\vec{P}+\vec{Q}}$ ½ m

When the forces are interchanged in position, let $'$ be the point from where resultant passes, then   ½ m

$\vec{AC'} = \dfrac{\vec{P}.AB}{\vec{P}+\vec{Q}}$ 1 m

As P>Q, we get $CC' = AC' - AC = \dfrac{\vec{P}-\vec{Q}}{\vec{P}+\vec{Q}} \times AB$ 1 m

25. The equation of the plane passing through the point $(1, 2, 3)$ is

$$a(x - 1) + b(y - 2) + c(z - 3) = 0 \qquad \text{1 m}$$

It passes through $(0, -1, 0) \Rightarrow -a - 3b - 3c = 0$

$$\Rightarrow a + 3b + 3c = 0 \quad \text{................ (i)} \qquad \text{1 m}$$

The plane is parallel to the line $\dfrac{x-1}{2} = \dfrac{y+2}{3} = \dfrac{2}{-3}$

$\therefore$ It is $\perp$ to normal to the plane

$\therefore$ $2a + 3b - 3c = 0$ .... (ii) $\qquad \text{1 m}$

From (i) and (ii), we get

$$\frac{a}{18} = \frac{b}{-9} = \frac{c}{3} \quad \Rightarrow \quad \frac{a}{6} = \frac{b}{-3} = \frac{c}{1} \qquad \text{½ m}$$

$\therefore$ Equation of plane is

$$6(x - 1) - 3(y - 2) + (z - 3) = 0 \qquad \text{½ m}$$

or $\ 6x - 3y + z - 3 = 0$

OR

Equation of sphere with extremities of diameters as

$(2, -3, 4)$ and $(-5, 6, -7)$ is

$$(x - 2)(x + 5) + (y + 3)(y - 6) + (z - 4)(z + 7) = 0 \qquad \text{1 m}$$

or $\quad x^2 + y^2 + z^2 + 3x - 3y + 3z = 56 \qquad \text{1 m}$

Here $\ \vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k}, \ \vec{b} = -5\hat{i} + 6\hat{j} - 7\hat{k} \qquad \text{1 m}$

$\therefore$ Vector equation of sphere is

$$\left[\vec{r} - (2\hat{i} - 3\hat{j} + 4\hat{k}) \right] \cdot \left[\vec{r} - (-5\hat{i} + 6\hat{j} - 7\hat{k}) \right] \qquad \text{1 m}$$

26. Here $\vec{a_1} = \hat{i} + 2\hat{j} + 3\hat{k}, \quad \vec{b_1} = \hat{i} - 3\hat{j} + 2\hat{k}$ 1 m

$\vec{a_2} = 4\hat{i} + 5\hat{j} + 6\hat{k}, \quad \vec{b_2} = 2\hat{i} + 3\hat{j} + \hat{k}$

$\therefore \quad \vec{a_2} - \vec{a_1} = 3\hat{i} + 3\hat{j} + 3\hat{k}$ 1 m

$$\vec{b_1} \times \vec{b_2} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & -3 & 2 \\ 2 & 3 & 1 \end{vmatrix} = -9\hat{i} + 3\hat{j} + 9\hat{k}$$ 1 m

$\therefore \quad \left| \vec{b_1} \times \vec{b_2} \right| = \sqrt{9^2 + 3^2 + 9^2} = \sqrt{171}$ 1 m

$\therefore$ Shortest distance d is given by

$$d = \left| \frac{\left(\vec{b_1} \times \vec{b_2} \right) \cdot \left(\vec{a_2} - \vec{a_1} \right)}{\left| \vec{b_1} \times \vec{b_2} \right|} \right|$$ 1 m

$$= \left| \frac{-27 + 9 + 27}{\sqrt{171}} \right| = \frac{9}{\sqrt{171}} \quad \text{or} \quad \frac{3}{\sqrt{19}}$$ 1 m

SECTION 'C'

19. Let the events A_1, A_2, A_3 and E be as follows

A_1 : the nut is manufactured by machine A

A_2 : the nut is manufactured by machine B   ½ m

A_3 : the nut is manufactured by machine C

E : the nut manufactured is defective

$\therefore \quad P(A_1) = 0.25, \ P(A_2) = 0.35, \ P(A_3) = 0.40$

$P(E/A_1) = 0.05, \ P(E/A_2) = 0.04, \ P(E/A_3) = 0.02$ 1 m

$$P(A_2/E) = \frac{P(A_2) . P(E/A_2)}{\sum_{i=1}^{3} P(A_i) . P(E/A_i)}$$ ½ m

$$= \frac{0.35 \times 0.04}{0.25 \times 0.05 + 0.35 \times 0.04 + 0.40 \times 0.02} = \frac{28}{69}$$ 1 m

20. Here Mean $= np = 9$ and variance $= npq = 6$ 1 m

$\therefore \quad q = \dfrac{6}{9} = \dfrac{2}{3}$

$\therefore \quad p = 1 - q = \dfrac{1}{3}$ 1 m

Again $np = 9$

$\Rightarrow \quad n \times \dfrac{1}{3} = 9 \Rightarrow n = 27$ 1 m

OR

Here $\lambda = np = 25 \times \dfrac{8}{100} = 2$ 1 m

Required probability $= P(X \geq 2)$ ½ m

$\qquad\qquad\qquad = 1 - P(X = 0) - P(X = 1)$ ½ m

$\qquad\qquad\qquad = 1 - \dfrac{e^{-2}}{1!} - \dfrac{2.e^{-2}}{1!}$

$\qquad\qquad\qquad = 1 - 3e^{-2} = 1 - 3(.135) = 0.595$ 1 m

21. Here $10 = \dfrac{srt.rt}{1 + rt} \quad \Rightarrow s = \dfrac{10(1 + rt)}{(rt)^2}$ (½+½)=1 m

$\therefore \quad s = \dfrac{10\left(1 + \dfrac{1}{100}\right)}{\left(\dfrac{1}{100}\right)^2}$ ½ m

$\qquad = 10 \times 101 \times 100 = 101000$ 1 m

$\therefore \quad$ Face value of bill $=$ Rs 101000   ½ m

22. Bankers Discount $=$ Rs $(21900 - 21720) =$ Rs 180   ½ m

Let the time be t years, $r = 5\%$

then B.D.$= srt \Rightarrow 180 = 21900 \times \dfrac{5}{100} \times t \Rightarrow t = 60$ days   1 m

Legal due date $= 13$ January

The bill is withdrawn 60 days before 13 January   ½ m

Counted back, we get   1 m

Jan.	Dec.	Nov.
13	31	16

$\Rightarrow$ Bill was discounted on 14 Nov. of same year.

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23. Profit sharing ratio of A and B initially $= 3 : 4$

$$A = \frac{3}{7}, \quad B = \frac{4}{7} \qquad \qquad \text{½ m}$$

Profit sharing ratio after joining of $C = 2 : 2 : 3$

$$A = \frac{2}{7}, \quad B = \frac{2}{7}, \quad C = \frac{3}{7} \qquad \qquad \text{½ m}$$

$\therefore$ Sacrificing ratio of A and B $= \dfrac{3}{7} - \dfrac{2}{7} : \dfrac{4}{7} - \dfrac{2}{7}$ $\qquad$ 1 m

$$= 1 : 2$$

$\therefore$ Share of A in premium $=$ Rs 4000 $\qquad\qquad (1+1) = 2$ m

$\therefore$ Share of B in premium $=$ Rs 8000

24. We have $\quad V = R\left[\dfrac{1 - (1+r)^{-n}}{r}\right]$

Here $\qquad R = 1200, \ n = 10, \ r = 0.12$ $\qquad\qquad$ 1 m

$\therefore \quad V = 1200 \times \left[\dfrac{1 - (1.12)^{-10}}{0.12}\right] = 1200 \times \left[\dfrac{1 - 0.3221}{0.12}\right]$ $\qquad$ 1½ m

$$= \dfrac{1200 \times 0.6779}{0.12} = 6779 \qquad\qquad \text{1 m}$$

$\therefore$ Present value of ordinary annuity is Rs 6779 $\qquad\qquad$ ½ m

25. $C = a + bx + cx^2$

$\therefore \quad AC = \dfrac{a}{x} + b + cx$ $\qquad\qquad$ ½ m

$\dfrac{d}{dx}(AC) = \dfrac{-a}{x^2} + c = \dfrac{cx^2 - a}{x^2}$ $\qquad\qquad$ 1 m

$MC = b + 2cx$ $\qquad\qquad$ 1 m

$\therefore \quad \dfrac{MC - AC}{x} = \dfrac{1}{x}\left[b + 2cx - \dfrac{a}{x} - b - cx\right] = \dfrac{cx^2 - a}{x^2} = \dfrac{d}{dx}(AC)$ $\qquad$ (½+1)=1½ m

OR

$$MR = 9 - 6x^2 + 2x$$

$$\therefore \quad R = \int (9 - 6x^2 + 2x)\,dx + c \qquad\qquad\qquad\qquad\qquad \text{½ m}$$

$$= 9x - 2x^3 + x^2 + c \qquad\qquad\qquad\qquad\qquad\qquad\qquad 1\ m$$

When $x = 0, R = 0, \Rightarrow c = 0$

$$\therefore \quad R = 9x - 2x^3 + x^2 \qquad\qquad\qquad\qquad\qquad\qquad\qquad 1½\ m$$

$$\text{Demand function} = p = \frac{R}{x} = 9 - 2x^2 + x \qquad\qquad\qquad 1\ m$$

26. Profit function $P = 22x + 18y$, where x is the number   1 m
of fans sold and y the number of sewing machines sold.

Constraints are $x + y \le 20,\ 360x + 240y \le 5760$ or $3x + 2y \le 48$ 2 m

$$x \ge 0,\ \dot{y} \ge 0$$
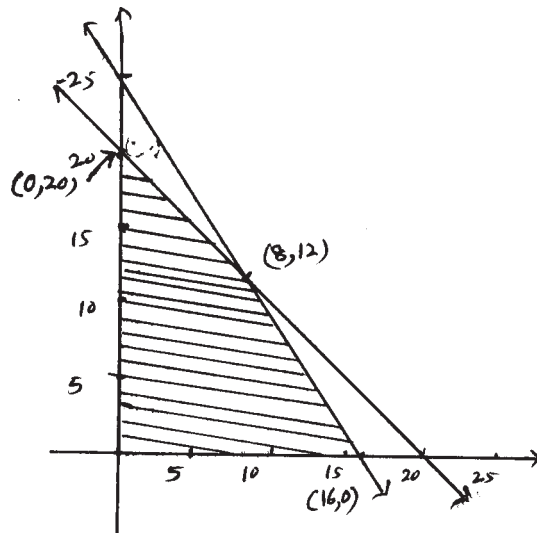
Graphing of problem and getting

feasible region as (0, 0), (16, 0) (8, 12) (0, 20)   1½ m

$P_{(0,0)} = 0,\ P_{(16,0)} = 352,\ P_{(8,12)} = 392$

$P_{(0,20)} = 360$ 1 m

$\therefore$ P is maximum for 8 fans and 12 sewing machines.   ½ m

EXPECTED ANSWERS/VALUE POINTS

SECTION - A

1.   Writing $A' = \begin{pmatrix} 1 & -6 & 4 \\ 3 & 8 & 6 \\ 5 & 3 & 5 \end{pmatrix}$ 1

$$\therefore \; \frac{1}{2} \; (A + A') = \frac{1}{2} \begin{pmatrix} 2 & -3 & 1 \\ -3 & 16 & 9 \\ 1 & 9 & 10 \end{pmatrix} = \begin{pmatrix} 1 & -\frac{3}{2} & \frac{1}{2} \\ -\frac{3}{2} & 8 & \frac{9}{2} \\ \frac{1}{2} & \frac{9}{2} & 5 \end{pmatrix}$$ 1

$$\frac{1}{2} \; (A - A') = \frac{1}{2} \begin{pmatrix} 0 & 9 & 9 \\ -9 & 0 & -3 \\ -9 & 3 & 0 \end{pmatrix} = \begin{pmatrix} 0 & \frac{9}{2} & \frac{9}{2} \\ -\frac{9}{2} & 0 & -\frac{3}{2} \\ -\frac{9}{2} & \frac{3}{2} & 0 \end{pmatrix}$$ ½

$$\therefore A = \begin{pmatrix} 1 & 3 & 5 \\ -6 & 8 & 3 \\ -4 & 6 & 5 \end{pmatrix} = \begin{pmatrix} 1 & -\frac{3}{2} & \frac{1}{2} \\ -\frac{3}{2} & 8 & \frac{9}{2} \\ \frac{1}{2} & \frac{9}{2} & 5 \end{pmatrix} + \begin{pmatrix} 0 & \frac{9}{2} & \frac{9}{2} \\ -\frac{9}{2} & 0 & \frac{3}{2} \\ -\frac{9}{2} & \frac{3}{2} & 0 \end{pmatrix}$$ ½

The first matrix is symmetric and second is skew symmetric.

2. $C_1 \rightarrow C_1 + C_2 + C_3, \Delta = \begin{vmatrix} a+b+c & -a+b & -a+c \\ a+b+c & 3b & c-b \\ a+b+c & b-c & 3c \end{vmatrix} = (a + b + c) \begin{vmatrix} 1 & -a+b & -a+c \\ 1 & 3b & c-b \\ 1 & b-c & 3c \end{vmatrix}$ 1

$$\Delta = (a + b + c) \begin{vmatrix} 1 & -a+b & -a+c \\ 0 & 2b+a & -b+a \\ 0 & -c+a & 2c+a \end{vmatrix}$$ 1

$R_2 \rightarrow R_2 - R_1$

$R_3 \rightarrow R_3 - R_1$

Expanding to get $\Delta = (a + b + c) \, (3ab + 3bc + 3ca) = 3 \, (a + b + c) \, (ab + bc + ca)$ 1

3. Given equation can be written as

$\dfrac{dy}{dx} + \cot x \cdot y = \cos x \cdot \sin x$ ∴ Integrating factor $= e^{\log \sin x} = \sin x$ ½ +½ = 1

∴ $y \cdot \sin x = \int \sin^2 x \cdot \cos x \, dx$ 1

⟹ $y \cdot \sin x = \dfrac{\sin^3 x}{3} + c$ or $y = \dfrac{1}{3} \sin^2 x + c \cdot \operatorname{cosec} x$ 1

4. $\dfrac{dy}{dx} = -A \sin x - B \cos x$ 1

∴ $\dfrac{d^2 y}{dx^2} = -A \cos x + B \sin x$ 1

∴ $\dfrac{d^2 y}{dx^2} = -(A \cos x - B \sin x) = -y$ ∴ $\dfrac{d^2 y}{dx^2} + y = 0$ 1

∴ $y = A \cos x - B \sin x$ is the solution of given differential equation

OR

Writing $\dfrac{dy}{dx} = \dfrac{3xy}{y^2 - x^2} = \dfrac{3y/x}{y^2/x^2 - 1}$ ½

Putting $\dfrac{y}{x} = v$ ⟹ $v + x \dfrac{dv}{dx} = \dfrac{3v}{v^2 - 1}$ ⟹ $x \dfrac{dv}{dx} = -\dfrac{v^3 - 4v}{v^2 - 1}$ 1

∴ $\int \dfrac{v^2 - 1}{v^3 - 4v} dv = -\int \dfrac{dx}{x}$ ⟹ $\dfrac{1}{8} \int \left(\dfrac{2}{v} + \dfrac{3}{v - 2} + \dfrac{3}{v + 2} \right) dv = -\int \dfrac{dx}{x}$ ½

∴ $2 \log v + 3 \log (v - 2) + 3 \log (v + 2) + 8 \log x = \log c$ ½

⟹ $v^2 (v^2 - 4)^3 x^8 = c$ ⟹ $y^2 (y^2 - 4x^2)^3 = c$ ½

5. $I = \int \dfrac{x^2 + 1}{(x + 1)^2} dx = \int \left(1 - \dfrac{2x}{(x + 1)^2} \right) dx = \int 1 \, dx - 2 \int \dfrac{1}{x + 1} dx + 2 \int \dfrac{1}{(x + 1)^2} dx$ 1+1

$= x - 2 \log |x + 1| - \dfrac{2}{x + 1} + c$ 1

OR

$$I = \int \frac{dx}{(x+1)(x^2+1)} = \int \left(\frac{\frac{1}{2}}{x+1} + \frac{-\frac{1}{2}x + \frac{1}{2}}{x^2+1} \right) dx \qquad \qquad 1\frac{1}{2}$$

$$= \frac{1}{2}\log|x+1| - \frac{1}{4}\int \frac{2x}{x^2+1}dx + \frac{1}{2}\int \frac{1}{x^2+1}dx$$

$$= \frac{1}{2}\log|x+1| - \frac{1}{4}\log|x^2+1| + \frac{1}{2}\tan^{-1}x + c \qquad \qquad 1\frac{1}{2}$$

6. $$\int \frac{2x.\tan^{-1}(x)^2}{1+x^4}dx = \int t \, dt \quad \text{where} \quad \tan^{-1}(x^2) = t \quad \therefore \quad \frac{2x}{1+x^4}dx = dt \qquad 1+1$$

$$= \frac{t^2}{2} + c = \frac{1}{2}\left[\tan^{-1}(x^2) \right]^2 + c \qquad \qquad 1$$

7. $$p = \frac{4}{52} = \frac{1}{13} \quad , \quad q = \frac{12}{13} \qquad \qquad 1$$

Number of Jacks (X) :	0	1.	2.
P(X) :	$\left(\dfrac{12}{13}\right)^2$	$2.\dfrac{1}{13}.\dfrac{12}{13}$	$\left(\dfrac{1}{13}\right)^2$

$1\frac{1}{2}$

	$\dfrac{144}{169}$	$\dfrac{24}{169}$	$\dfrac{1}{169}$

$\frac{1}{2}$

8. $$P\,(\text{Head}) = \frac{1}{2} \qquad P\,(\text{Tail}) = \frac{1}{2} \qquad \qquad 1$$

$$P\,(B \text{ wins}) = P\,[(\overline{A}\,B) \text{ OR } (\overline{A}\,\overline{B}\,\overline{A}\,B) \text{ OR } (\overline{A}\,\overline{B}\,\overline{A}\,\overline{B}\,\overline{A}\,B) \text{ OR } \ldots\ldots]$$

1

$$= \left(\frac{1}{2}.\frac{1}{2} \right) + \left(\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2} \right) + \left(\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2}.\frac{1}{2} \right) + \ldots\ldots$$

$$= \frac{1}{4}\left(1 + \frac{1}{4} + \left(\frac{1}{4}\right)^2 + \ldots\ldots \right) = \frac{1}{4}\left(\frac{1}{1-\frac{1}{4}} \right) = \frac{1}{4}.\frac{4}{3} = \frac{1}{3} \qquad \qquad 1$$

9.   The truth table for the hypothesis and conclusion is:

		Hypothesis		Conclusion
p	q	pvq	~p	~q
T	T	T	F	F
T	F	T	F	T
F	T	T	T	(F) ← Critical row
F	F	F	T	T

For correct truth table   2½

For critical row   1

There is only one critical row in which the conclusion is false $\Rightarrow$ Argument is invalid   ½

OR

Input		Output
p	q	s = pv(~q)
1	1	1
1	0	1
0	1	0
0	0	1

First two colums   ½ + ½

For s = p v (~ q)   1

Correct Output   2

10. $$\lim_{x\to\infty}\left(\sqrt{x^2+x+1}-x\right)=\lim_{x\to\infty}\frac{\left(\sqrt{x^2+x+1}-x\right)\left(\sqrt{x^2+x+1}+x\right)}{\left(\sqrt{x^2+x+1}+x\right)}$$ 1

$$=\lim_{x\to\infty}\frac{x+1}{\sqrt{x^2+x+1}+x}=\lim_{x\to\infty}\frac{1+\dfrac{1}{x}}{\sqrt{1+\dfrac{1}{x}+\dfrac{1}{x^2}}+1}$$ 1+1

$$=\frac{1}{1+1}\quad=\frac{1}{2}$$ 1

11. $\dfrac{dy}{dx} = \lim\limits_{\Delta x \to 0} \dfrac{\sqrt{\tan\ (x + \Delta x)} - \sqrt{\tan\ x}}{\Delta x}$ 1

$= \lim\limits_{\Delta x \to 0} \dfrac{1}{\left(\sqrt{\tan\ (x + \Delta x)} + \sqrt{\tan\ x}\right)} \cdot \dfrac{[\tan\ (x + \Delta x) - \tan\ x]}{\Delta x}$ 1

$= \dfrac{1}{2\sqrt{\tan\ x}} \cdot \lim\limits_{\Delta x \to 0} \dfrac{\tan\ (x + \Delta x - x)[1 + \tan\ (x + \Delta x).\tan\ x]}{\Delta x}$ 1

$= \dfrac{1}{2\sqrt{\tan\ x}} \cdot 1.(1 + \tan^2 x) = \dfrac{\sec^2 x}{2\sqrt{\tan\ x}}$ 1

12. Getting $\dfrac{dy}{dx} = \dfrac{1}{2\sqrt{x}} - \dfrac{1}{2x\sqrt{x}}$ 1½

$\therefore \quad 2x\dfrac{dy}{dx} = \sqrt{x} - \dfrac{1}{\sqrt{x}}$ 1

$2x\dfrac{dy}{dx} + y = \left(\sqrt{x} - \dfrac{1}{\sqrt{x}}\right) + \left(\sqrt{x} + \dfrac{1}{\sqrt{x}}\right) = 2\sqrt{x}$ 1½

OR

Put $x^2 = \cos 2\theta$ to get $y = \tan^{-1}\left[\dfrac{\sqrt{1 + \cos 2\theta} - \sqrt{1 - \cos 2\theta}}{\sqrt{1 + \cos 2\theta} + \sqrt{1 - \cos 2\theta}}\right]$ 1

$= \tan^{-1}\left[\dfrac{\sqrt{2}\cos\theta - \sqrt{2}\sin\theta}{\sqrt{2}\cos\theta + \sqrt{2}\sin\theta}\right]$ 1

$= \tan^{-1}\left[\dfrac{1 - \tan\theta}{1 + \tan\theta}\right] = \tan^{-1}\left[\tan\left(\dfrac{\pi}{4} - \theta\right)\right] = \dfrac{\pi}{4} - \theta$ 1

$\therefore \quad y = \dfrac{\pi}{4} - \dfrac{1}{2}\cos^{-1}x^2 \ \Rightarrow \ \dfrac{dy}{dx} = \dfrac{x}{\sqrt{1 - x^4}}$ 1

13. RHS $= \int_0^a f(a-x)dx = -\int_0^a f(y)dy$ where $(a-x) = y$ 1

$= \int_0^a f(y)dy = \int_0^a f(x)dx = $ LHS   1

$I = \int_0^{\pi/2} \dfrac{dx}{1+\tan x} = \int_0^{\pi/2} \dfrac{\cos x}{\cos x + \sin x}dx$ .... (i)   ½

$= \int_0^{\pi/2} \dfrac{\cos(\pi/2 - x)}{\cos(\pi/2 - x) + \sin(\pi/2 - x)}dx = \int_0^{\pi/2} \dfrac{\sin x}{\sin x + \cos x}dx$ .... (ii)   ½

$\Rightarrow 2I = \int_0^{\pi/2} 1\,dx = \big[x\big]_0^{\pi/2} = \pi/2$ ½

$\Rightarrow I = \pi/4$ ½

14. $I = \int \sqrt{\tan\theta}\,d\theta$ Put $\tan\theta = x^2$ $\therefore$ $\sec^2\theta\,d\theta = 2x\,dx \Rightarrow d\theta = \dfrac{2x}{x^4+1}dx$ ½

$= \int \dfrac{2x^2}{x^4+1}dx = \int \dfrac{x^2+1}{x^4+1}dx + \int \dfrac{x^2-1}{x^4+1}dx = \int \dfrac{1+1/x^2}{x^2+1/x^2}dx + \int \dfrac{1-1/x^2}{x^2+1/x^2}dx = I_1 + I_2$ ½

$I_1 = \int \dfrac{1+1/x^2}{x^2+1/x^2}dx = \int \dfrac{1+1/x^2}{(x-1/x)^2+2}dx = \int \dfrac{dt}{t^2+2}$ where $x - \dfrac{1}{x} = t$ ½

$= \dfrac{1}{\sqrt 2}\tan^{-1}\dfrac{t}{\sqrt 2} + c_1 = \dfrac{1}{\sqrt 2}\tan^{-1}\left(\dfrac{x^2-1}{\sqrt 2\,x}\right) + c_1 = \dfrac{1}{\sqrt 2}\tan^{-1}\left(\dfrac{\tan\theta-1}{\sqrt 2\tan\theta}\right) + c_1$ 1

$I_2 = \int \dfrac{1-1/x^2}{x^2+1/x^2}dx = \int \dfrac{1-1/x^2}{(x+1/x)^2-2}dx = \int \dfrac{dz}{z^2-2}$ where $x + \dfrac{1}{x} = z$

$= \dfrac{1}{\sqrt 2}\log\left(\dfrac{z-\sqrt 2}{z+\sqrt 2}\right) + c_2 = \dfrac{1}{2\sqrt 2}\log\left(\dfrac{x^2+1-\sqrt 2 x}{x^2+1+\sqrt 2 x}\right) + c_2 = \dfrac{1}{2\sqrt 2}\log\left(\dfrac{\tan\theta+1-\sqrt 2\tan\theta}{\tan\theta+1+\sqrt 2\tan\theta}\right) + c_2$ 1

$\therefore$ $I = \dfrac{1}{\sqrt 2}\tan^{-1}\left(\dfrac{\tan\theta-1}{\sqrt 2\tan\theta}\right) + \dfrac{1}{2\sqrt 2}\log\left(\dfrac{\tan\theta+1-\sqrt 2\tan\theta}{\tan\theta+1+\sqrt 2\tan\theta}\right) + c$ ½

15. $f'(x) = 3x^2 - 24x + 36 = 3(x^2 - 8x + 12) = 3(x - 2)(x - 6)$ 1

$f'(x) = 0 \Rightarrow x = 2, x = 6$

∴ Possible intervals are $(-\infty, 2), (2, 6), (6, \infty)$ 1

Since $f'(x) > 0$ in $(-\infty, 2), (6, \infty)$

∴ $f(x)$ is increasing in $(-\infty, 2) \cup (6, \infty)$ 1

And $f'(x) < 0$ in $(2, 6)$ ∴ $f(x)$ is decreasing in $(2, 6)$ 1

16.   Writing the system of equations as

$$\begin{pmatrix} 3 & -1 & 1 \\ 2 & -2 & 3 \\ 1 & 1 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 5 \\ 7 \\ -1 \end{pmatrix} \text{ i.e } AX = B \qquad \therefore X = A^{-1}B$$ 1

$|A| = 3(-1) + 1(-5) + 1(4) = -3 - 5 + 4 = -4 \neq 0$ 1

$a_{11} = -1, \quad a_{12} = 5, \quad a_{13} = 4,$

$a_{21} = 0, \quad a_{22} = -4, \quad a_{23} = -4$ (1 Mark for any 4 correct co-factors)   2

$a_{31} = -1, \quad a_{32} = -7, \quad a_{33} = -4,$

$$\therefore \quad A^{-1} = -\frac{1}{4} \begin{pmatrix} -1 & 0 & -1 \\ 5 & -4 & -7 \\ 4 & -4 & -4 \end{pmatrix}$$ ½

$$\therefore \quad \begin{pmatrix} x \\ y \\ z \end{pmatrix} = -\frac{1}{4} \begin{pmatrix} -1 & 0 & -1 \\ 5 & -4 & -7 \\ 4 & -4 & -4 \end{pmatrix} \begin{pmatrix} 5 \\ 7 \\ -1 \end{pmatrix} = \begin{pmatrix} 1 \\ -1 \\ 1 \end{pmatrix}$$

∴ $x = 1, \; y = -1, \; x = 1$ 1½

17.   Let the dimensions of box be $\ell = x,\ b = x,\ h = y$

$\therefore$ Surface area $= x^2 + 4xy = c^2$ .... (i)   1

Volume $v = x^2 y = x^2\left[\dfrac{c^2 - x^2}{4x}\right] = \dfrac{1}{4}(c^2 x - x^3)$ 1½

$\dfrac{dv}{dx} = 0 \ \Rightarrow \ \dfrac{1}{4}(c^2 - 3x^2) = 0 \ \Rightarrow \ x = \dfrac{c}{\sqrt{3}}$ 1+ ½

$\dfrac{d^2 v}{dx^2} = \dfrac{1}{4}(-6x)$, i.e. negative. $\therefore \ x = \dfrac{c}{\sqrt{3}}$ will give maximum volume.   1

$\therefore$ Maximum Volume $= \dfrac{1}{4} \ \times \ (c^2 - x^2) = \dfrac{c}{4\sqrt{3}} \ \left[c^2 - \dfrac{c^2}{3}\right] \ = \ \dfrac{c^3}{6\sqrt{3}}$ cubic units   1

<div align="center">

OR

</div>
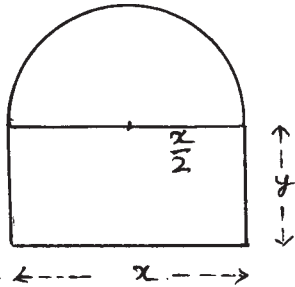
Let the dimensions of window be x, y.

$\therefore$ Perimeter $= x + 2y + \pi \ \dfrac{x}{2} \ = 30$ m. .... (i)   1

Area $A = xy + \dfrac{1}{2} \ \pi \ \dfrac{x^2}{4}$ .... (ii)   1

From (i), $y = 15 - \dfrac{x}{2} - \pi \dfrac{x}{4}$ $\therefore \ A = 15x - \dfrac{x^2}{2} - \dfrac{\pi x^2}{4} + \dfrac{\pi x^2}{8} = 15x - \dfrac{x^2}{2} - \pi \dfrac{x^2}{8}$ 1

$\dfrac{dA}{dx} = 0 \ \Rightarrow 15 - x - \dfrac{\pi x}{4} = 0 \ \Rightarrow x = \dfrac{60}{4 + \pi}$ m.   1

$$y = \dfrac{30}{4 + \pi}$$ ½

$\dfrac{d^2 A}{dx^2} = -1 - \dfrac{\pi}{4}$, i.e. negative

$\therefore$ $x = \dfrac{60}{4 + \pi}$ will give Maximum area (i.e. Max. light)   1

$\therefore$ Dimensions of window for maximum light will be

$\dfrac{60}{4 + \pi}, \dfrac{30}{4 + \pi}$ with radius $= \dfrac{30}{4 + \pi}$ ½

18.
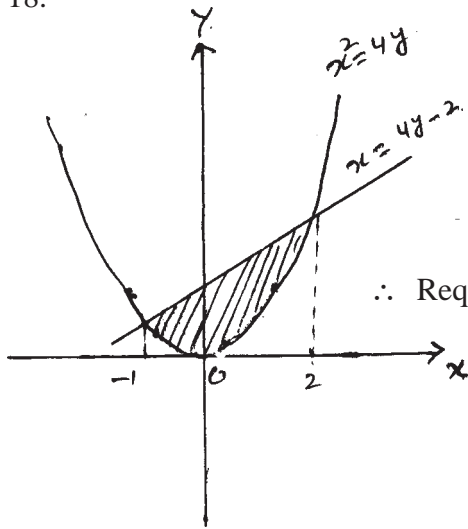
Correct Figure   1

Points of intersection of two curves

are $x = -1, \; x = 2$.   1

$\therefore$ Required area $= \dfrac{1}{4}\displaystyle\int_{-1}^{2}(x+2)\,dx - \dfrac{1}{4}\displaystyle\int_{-1}^{2}x^2\,dx$ 1

$= \dfrac{1}{4}\left[\dfrac{x^2}{2}+2x\right]_{-1}^{2} - \dfrac{1}{4}\left[\dfrac{x^3}{3}\right]_{-1}^{2}$ 1½

$= \dfrac{1}{4}\left[2+4-\dfrac{1}{2}+2-\dfrac{8}{3}-\dfrac{1}{3}\right] = \dfrac{9}{8}$ sq. Units   1½

OR

$\displaystyle\int_{0}^{2}f(x)\,dx = \lim_{\substack{h\to 0 \\ or\; n\to\infty}} h[f(0)+f(0+h)+f(0+2h)+\ldots\ldots+f(0+(n-1)h)]$

where $f(x) = x^2 + x + 2, \quad h = \dfrac{2}{n}$ 1+½

$= \lim_{n\to\infty} h\,[2+(h^2+h+2)+(2^2h^2+2h+2)+\ldots\ldots+((n-1)^2h^2+(n-1)h+2)]$ 1

$= \lim_{n\to\infty} h\left[2n+h^2(1^2+2^2+3^2+\ldots\ldots(n-1^2)+h(1+2+3+\ldots\ldots+(n-1)\right]$ 1

$= \lim_{n\to\infty} \dfrac{2}{n}\cdot\left[2n+\dfrac{4}{n^2}\cdot\dfrac{n(n-1)(2n-1)}{6}+\dfrac{2}{n}\cdot\dfrac{n(n-1)}{2}\right]$ 1

$= \lim_{n\to\infty} 2\left[2+\dfrac{2}{3}\left(1-\dfrac{1}{n}\right)\left(2-\dfrac{1}{n}\right)+\left(1-\dfrac{1}{n}\right)\right]$ ½

$= 2\left[2+\dfrac{4}{3}+1\right] = \dfrac{26}{3}$ 1

19.   Let $\vec{p} = \vec{a} + \vec{b} = \left(5\hat{i} + \hat{k}\right)$, $\vec{q} = \vec{a} + \vec{b} = \left(-\hat{i} - 2\hat{j} + 5\hat{k}\right)$ 1

   Using $\cos\theta = \dfrac{\vec{p} \cdot \vec{q}}{|\vec{p}||\vec{q}|}$, we get   1

   $\cos\theta = 0 \implies \theta = \dfrac{\pi}{2}$ 1

20.   Let in Δ ABC, $BC = \vec{a}$, $CA = \vec{b}$ and $\vec{AB} = \vec{c}$

   $\therefore \quad \vec{a} + \vec{b} + \vec{c} = \vec{o}$ ½

   $\vec{a} \times \vec{a} + \vec{a} \times \vec{b} + \vec{a} \times \vec{c} = \vec{o} \implies \vec{a} \times \vec{b} = \vec{c} \times \vec{a}$ .... (i)   ½

   and $\vec{a} \times \vec{b} + \vec{b} \times \vec{b} + \vec{c} \times \vec{b} = \vec{o} \implies \vec{a} \times \vec{b} = \vec{b} \times \vec{c}$ .... (ii)   ½

   $\therefore \quad \vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a} \implies \left[\vec{a} \times \vec{b}\right] = \left[\vec{b} \times \vec{c}\right] = \left[\vec{c} \times \vec{a}\right]$ 1

   $\therefore \quad ab\sin C = bc\sin A = ca\sin B \quad$ or $\quad \dfrac{\sin C}{c} = \dfrac{\sin A}{a} = \dfrac{\sin B}{b}$ ½

   $\therefore \quad \dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

21.   Any point on the line $\dfrac{x+1}{2} = \dfrac{y+2}{3} = \dfrac{z+3}{4}$ is $(2\lambda - 1, 3\lambda - 2, 4\lambda - 3)$ 1

   If the line meets the plane, then this point must satisfy the equation

   of plane for some value of λ

   $\therefore (2\lambda - 1) + (3\lambda - 2) + 4(4\lambda - 3) = 6 \implies \lambda = 1$ 1

   $\therefore$ Coordinates of required point are $(1, 1, 1)$ 1

22.

P(1, 2, 3)

$2x + 2y + 4z = 38$
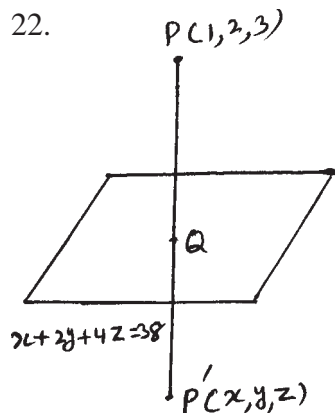
P'(x, y, z)

Let P′(x, y, z) be the image of P in the given plane.

∴ Equation of line PP′ is $\dfrac{x-1}{1} = \dfrac{y-2}{2} = \dfrac{z-3}{4}$ .... (i) **1**

Any point on this line is $(\lambda + 1,\ 2\lambda + 2,\ 4\lambda + 3)$

If this point is Q, then $(\lambda + 1) + 2(2\lambda + 2) + 4(4\lambda + 3) = 38$

$\Rightarrow \lambda = 1 \ \Rightarrow \ Q\,(2, 4, 7)$ **1**

Q is the mid-point of PP′

∴ $\dfrac{1+x}{2} = 2 \Rightarrow x = 3,\ \dfrac{2+y}{2} = 4 \Rightarrow y = 6,\ \dfrac{3+z}{2} = 7, \Rightarrow z = 11$

∴ Image (P′) is (3, 6, 11) **1**

23.

$|\vec{r}| = 5 \Rightarrow$ Centre is $(0, 0, 0)$ and radius $= 5$. **1½**
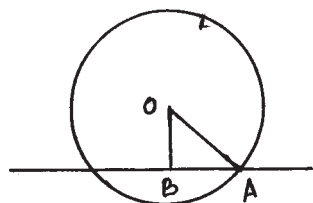
$d = OB = \dfrac{\left|-3\sqrt{3}\right|}{\sqrt{3}} = 3.$ **1½**

∴ $AB^2 = OA^2 - OB^2 = (5)^2 - (3)^2 = 16 \Rightarrow AB = 4$ **1**

i.e. radius of circular section $= 4$

24. $P^2 + Q^2 + 2PQ\cos\theta = (2m+1)^2(P^2 + Q^2) \Rightarrow \cos\theta = \left[(2m+1)^2 - 1\right]\dfrac{P^2 + Q^2}{2PQ}$ **1½**

$P^2 + Q^2 + 2P\theta\cos\left(\dfrac{\pi}{2} - \theta\right) = (2m-1)^2(P^2 + Q^2) \Rightarrow \sin\theta = \left[(2m-1)^2 - 1\right]\dfrac{P^2 + Q^2}{2PQ}$ **1½**

∴ $\tan\theta = \dfrac{(2m-1)^2 - 1}{(2m+1)^2 + 1} = \dfrac{(2m)(2m-2)}{(2m)(2m+2)} = \dfrac{m-1}{m+1}$ **1**

25. <div align="right">Correct Figure   ½</div>
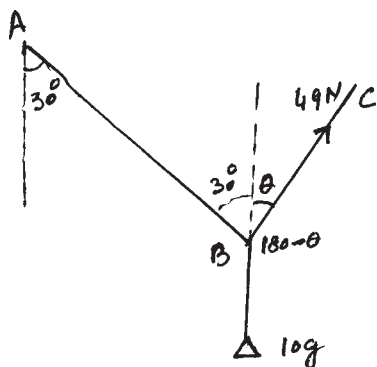
Let the force 49 N act at angle of θ with the vertical and let T be the tension in the string.

∴ By Lami's theorem we have

$$\frac{T}{\sin(180-\theta)} = \frac{10g}{\sin(30°+\theta)} = \frac{49}{\sin 150°}$$ 1

$$\therefore \frac{T}{\sin\theta} = \frac{98}{\sin(30°+\theta)} = \frac{49}{\tfrac{1}{2}}$$ ½

$$\therefore \sin(30°+\theta°)=1 \Rightarrow 30°+\theta=90° \Rightarrow \theta=60°$$ 1

$$T = 98\cdot\sin 60° = 98\cdot\frac{\sqrt{3}}{2} = 49\sqrt{3} \ \ N$$ 1

26. <div align="center">Correct figure   1</div>

Let u be the velocity of projection with angle , then using

$$y = x\tan\alpha - \frac{gx^2}{2u^2\cos^2\alpha}$$ 1

at A, $10 = 15\tan\alpha - \dfrac{225g}{2u^2\cos^2\alpha}$ .... (i) and   1

at B, $10 = 45\tan\alpha - \dfrac{2025g}{2u^2\cos^2\alpha}$ .... (ii)   1

Muliplying (i) by 9 and subtracting (ii) from it we get

$$80 = 90\tan\alpha \Rightarrow \tan\alpha = \frac{8}{9} \Rightarrow \alpha = \tan^{-1}\frac{8}{9}$$ 1+1

<div align="center">**SECTION C**</div>

19.   Let E_1 : bolt from machine A, E_2: bolt from machine B

E_3 : bolt from machine C, H : Getting a defective bolt

$$P(E_1) = \frac{25}{100}, \quad P(E_2) = \frac{35}{100}, \quad P(E_3) = \frac{40}{100},$$ 1

$$P(H/E_1) = \frac{5}{100}, \quad P(H/E_2) = \frac{4}{100}, \quad P(H/E_3) = \frac{2}{100}$$

$$P(E_2/H) = \frac{P(E_2).P(H/E_2)}{P(E_1).P(H/E_1) + P(E_2)P(H/E_2) + P(E_3)P(H/E_3)}$$ 1

$$= \frac{\dfrac{35}{100} \cdot \dfrac{4}{100}}{\dfrac{25}{100} \cdot \dfrac{5}{100} + \dfrac{35}{100} \cdot \dfrac{4}{100} + \dfrac{40}{100} \cdot \dfrac{2}{100}}$$ ½

$$= \frac{28}{69}$$ ½

20.   Mean $= np = 4$, Variance $= npq = \dfrac{4}{3} \Rightarrow q = \dfrac{1}{3}$,   1

$$\therefore \quad p = 1 - \frac{1}{3} = \frac{2}{3}$$ 1

$$n = \frac{4.3}{2} = 6$$

$\therefore$ Distribution is $\left(\dfrac{1}{3} + \dfrac{2}{3}\right)^{6}$

$$P(X \geq 1) = 1 - P(X = 0) = 1 - \left(\frac{1}{3}\right)^{6} \quad \text{or} \quad \frac{728}{729}$$ 1

21. $BD = s.r.t = 1250$, $s =$ face value, $r =$ rate%, $t =$ time   ½

$BG = BD - TD = s.r.t - \dfrac{srt}{1 + rt} = \dfrac{srt \cdot rt}{1 + rt} = 50$ ½

$$\therefore \quad 1250 \, rt = 50 \, (1 + rt) \Rightarrow rt = \frac{50}{1200} = \frac{5}{120}$$ 1

$$\therefore \quad s = \frac{1250}{rt} = \frac{1250 \times 120}{5} = \text{Rs } 30,000$$ 1

22. $BG = \dfrac{srt \cdot rt}{1 + rt} = \dfrac{5050\left(\dfrac{5}{100}\right)^{2} t^{2}}{1 + \dfrac{5}{100} \cdot t} = \dfrac{50}{100}$ 1

$\Rightarrow 505 \, t^{2} - t - 20 = 0$ solving to get $t = \dfrac{1}{5} = 73$ days   1

$\therefore$ Nominal date of maturity is 70 days ofter 4th July, 2005

$\therefore$ July   Aug   Sept

         27   31   12   i.e 12th Sept 2005   1

23.   Amount $= Rs [575000 - 75000] = Rs. 500,000$ ½

rate % $i = \dfrac{5}{100} = 0.05, \quad n = 20$

Using $S = \dfrac{P}{i}\left[(1+i)^n)-1\right] \Rightarrow P = \dfrac{S.i}{(1+i)^n - 1}$ 1+½

$P = \dfrac{(500,000)(.05)}{(1.05)^{20} - 1} = \dfrac{25000}{2.655 - 1} = \dfrac{25000}{1.655}$ 1

$= Rs\ 15105.74\ \ or\ \ Rs\ 15106$ 1

24.   Profit sharing ratio of A and B is 5:3

A's Contribution is 1/5 share of $C = \dfrac{1}{5} \cdot \dfrac{5}{8} = 5/40$ ½

B's Contribution is 1/5 share of $C = \dfrac{1}{5} \cdot \dfrac{3}{8} = 3/40$ ½

∴ New Profit Sharing ratio $A : B : C \quad \left(\dfrac{5}{8} - \dfrac{5}{40}\right) : \left(\dfrac{3}{8} - \dfrac{3}{40}\right) : \left(\dfrac{1}{5}\right)$ ½

or $\dfrac{20}{40} : \dfrac{12}{40} : \dfrac{8}{40}$, or $5 : 3 : 2$ 1

Since sacrificing ratio is 5 : 3

∴   share in goodwill money $= \dfrac{5}{8} \cdot 96000 = Rs\ 60,000$ 1

B's share $= Rs\ 36,000$ ½

25.   Cost function $C(x) = 900 + 3x + \dfrac{x^2}{100}$

$AC = \dfrac{900}{x} + 3 + \dfrac{x}{100}$ 1

$\dfrac{d}{dx}\ (AC) = -\dfrac{900}{x^2} + \dfrac{1}{100}$ 1

$\dfrac{d}{dx}\ (AC) = 0 \Rightarrow x^2 = 90000 \Rightarrow x = 300$ 1

$\dfrac{d^2(AC)}{dx^2} = \dfrac{1800}{x^3}$, i.e. + ve ∴ $x = 300$ will give minimum A.C.   1

26. Let Amount invested in Bonds A = Rs. x

and Amount invested in Bonds B = Rs. y

∴ L.P.P. becomes: Maximise $I = \dfrac{8x}{100} + \dfrac{10y}{100}$ 1
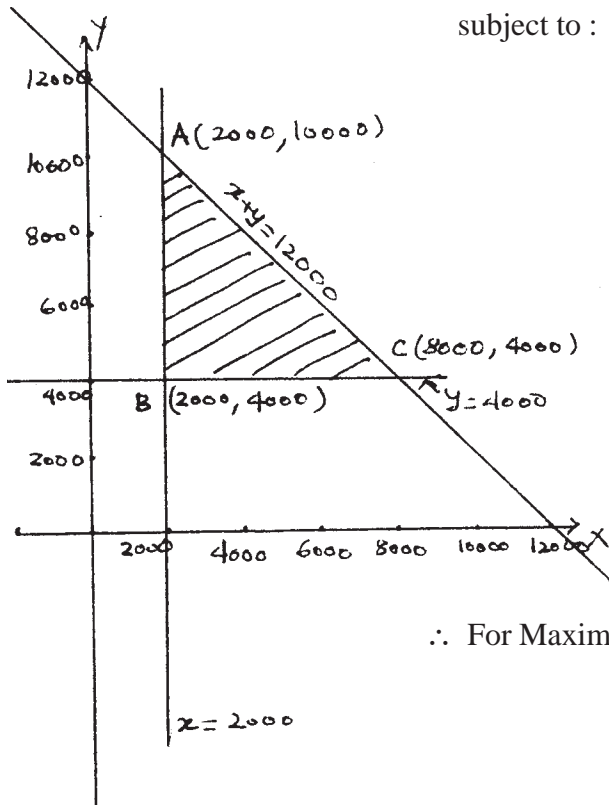
subject to : $x + y \le 12000$

$x \ge 2000$ 1½

$y \ge 4000$

$x \ge 0, \quad y \ge 0$

For correct graph

& correct feasible region   2

$I_A = 160 + 1000 = 1160$

$I_B = 160 + 400 = 560$ 1

$I_C = 640 + 400 = 1040$

∴ For Maximum Interest

Amount invested in Bond A = Rs. 2000

Amount invested in Bond B = Rs. 10,000

Maximum Interest recieved = Rs. 1160   ½

PHYSICS (Theory)

Time allowed : 3 hours   *Maximum Marks : 70*

General Instructions :

(i)   All questions are compulsory.

(ii) There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and one question of five marks. You have to attempt only one of the choices in such questions.

(iii) Question numbers **1** to **5** are very short answer type questions, carrying **one** mark each.

(iv) Question numbers **6** to **12** are short answer type questions, carrying **two** marks each.

(v)   Question numbers **13** to **24** are also short answer type questions, carrying **three** marks each.

(vi) Question numbers **25** to **27** are long answer type questions, carrying **five** marks each.

(vii) Use of calculators is not permitted. However, you may use log tables,x if necessary.

(viii) You may use the following values of physical constants wherever necessary :

$$c = 3 \times 10^8 \, ms^{-1}$$
$$h = 6.6 \times 10^{-34} \, Js$$
$$e = 1.6 \times 10^{-19} \, C$$
$$\mu_0 = 4\pi \times 10^{-7} \, Tm \, A^{-1}$$
$$m_e = 9.1 \times 10^{-31} \, Kg$$
$$\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9 \, N-m^2/C^2$$
$$\text{Mass of neutron } m_n \cong 1.6 \times 10^{-27} kg$$
$$\text{Boltzmann 's constant } k = 1.38 \times 10^{-23} J \, K^{-1}$$
$$\text{Avogadro's number } N_A = 6.023 \times 10^{23} / mole$$

QUESTION PAPER CODE 55/1/1

1.   Define the term 'dielectric constant' of a medium in terms of capacitance of a capacitor.   1

2.   Sketch a graph showing variation of resistivity of carbon with temperature.   1

3.   The vertical component of Earth's magnetic field at a place is $\sqrt{3}$ times the horizontal component. What is the value of angle of dip at this place ?   1

4. With what purpose was famous Davisson-Germer experiment with electrons performed ? 1

5   Name the type of communication in which the signal is a discrete and binary coded version of the message or information. 1

6. The electric field and electric potential at any point due to a point charge kept in air is $20\ \text{NC}^{-1}$ and $10\ \text{NC}^{-1}$ respectively. Compute the magnitude of this charge. 2

7. Write the mathematical relation between mobility and drift velocity of charge carriers in a conductor. Name the mobile charge carriers responsible for conduction of electric current in (i) an electrolyte (ii) an ionised gas. 2

8. State the principle of working of a cyclotron. Write two uses of this machine. 2

9. Draw a labelled ray diagram of a reflecting type telescope. Write its any one advantage over refracting type telescope. 2

10. Draw and explain the output waveform across the load resistor R, if the input waveform is as shown in the given figure. 2
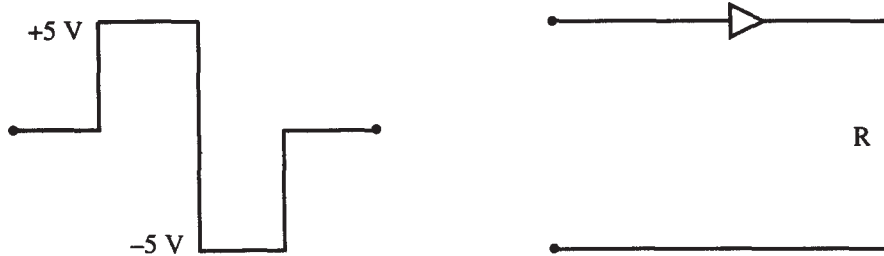
OR

Explain how the width of depletion layer in a p-n junction diode changes when the junction is (i) forward biased (ii) reverse biased.

11. The given graph shows the variation of charge q versus potential difference V for two capacitors C_1 and C_2. The two capacitors have same plate separation but the plate area of C_2 is double than that of C_1. Which of the lines in the graph correspond to C_1 and C_2 and why ? 2
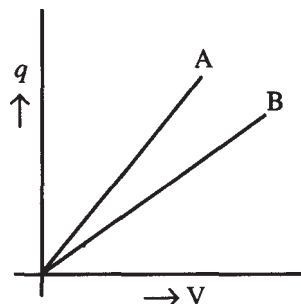
12. Two cells E_1 and E_2 in the given circuit diagram have an emf of 5 V and 9 V and internal resistance of 0.3 Ω and 1.2 Ω respectively. 2
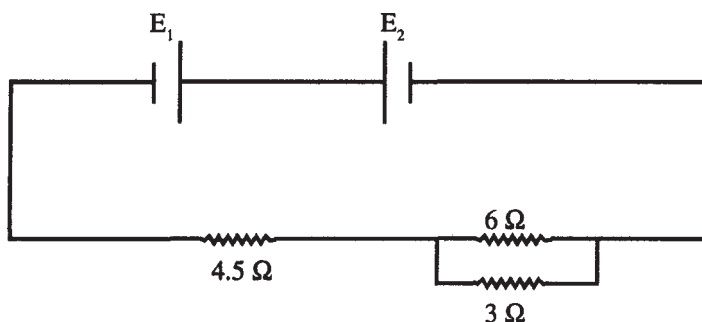
Calculate the value of current flowing through the resistance of 3Ω .

13. How is the mutual inductance of a pair of coils affected when : 3

(i) separation between the coils is increased ?

(ii) the number of turns of each coil is increased ?

(iii) a thin iron sheet is placed between the two coils, other factors remaining the same ? Explain your answer in each case.

14. A convex lens made up of glass of refractive index 1.5 is dipped, in turn, in : 3

(i) medium A of refractive index 1.65

(ii) medium B of refractive index 1.33

Explain, giving reasons, whether it will behave as a converging lens or a diverging lens in each of these two media.

15. Define the terms threshold frequency and stopping potential in relation to the phenomenon of photoelectric effect. How is the photoelectric current affected on increasing the (i) frequency (ii) intensity of the incident radiations and why ? 3

16. Explain, with the help of a nuclear reaction in each of the following cases, how the neutron to proton ratio changes during (i) alpha-decay (ii) beta-decay ? 3

17. What is an intrinsic semiconductor ? How can this material be converted into (i) P-type (ii) N-type extrinsic semiconductor ? Explain with the help of energy band diagrams. 3

18. Why is the mass of a nucleus always less than the sum of the masses of its constituents, neutrons and protons ? 3

If the total number of neutrons and protons in a nuclear reaction is conserved, . how then is the energy absorbed or evolved in the reaction ? Explain.

OR

Draw a graph showing the variation of binding energy per nucleon with mass number for different nuclei. Explain, with the help of this graph, the release of energy by the process of nuclear fusion.

19. Define the term modulation. Name three different types of modulation used for a message signal using a sinusoidal continuous carrier wave. Explain the meaning of any one of these.   3

20. What is electric flux ? Write its S.I. units.

Using Gauss's theorem, deduce an expression for the electric field at a point due to a uniformly charged infinite plane sheet.   3

21. A 10 m long wire of uniform cross-section and 20 Ω resistance is used in a potentiometer. The wire is connected in series with a battery of 5 V along with an external resistance of 480 Ω . If an unknown emf E is balanced at 6.0 m length of the wire, calculate :   3
    (i) the potential gradient of the potentiometer wire
    (ii) the value of unknown emf E

22. Draw a circuit diagram for use of NPN transistor as an amplifier in common emitter configuration. The input resistance of a transistor is 1000 Ω . On changing its base current by 10 μA, the collector current increases by 2 mA. If a load resistance of 5 KΩ . is used in the circuit, calculate :   1+2
    (i) the current gain
    (ii) voltage gain of the amplifier

23. Define the term 'critical frequency' in relation to sky wave propagation of electromagnetic waves.

On a particular day, the maximum frequency reflected from the ionosphere is 10 MHz. On another day, it was found to decrease to 8 MHz. Calculate the ratio of the maximum electron densities of the ionosphere on the two days.   3

24. Draw a labelled diagram of Hertz's experimental set-up to produce electromagnetics waves. Explain the generation of electromagnetic waves using this set-up.   3

25. The given circuit diagram shows a series LCR circuit connected to a variable frequency 230 V source :   5

5.0 H   80 μF   40 Ω

230 V

127
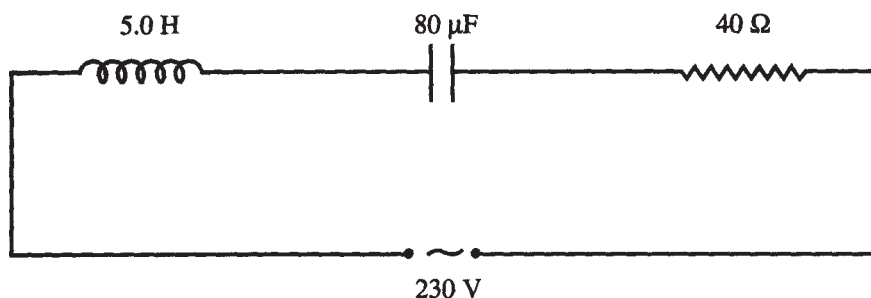
(a) Determine the source frequency which drives the circuit in resonance.

(b) Obtain the impedance of the circuit and the amplitude of current at the resonating frequency.

(c) Determine the rms potential drops across the three elements of the circuit.

(d) How do you explain the observation that the algebraic sum of the voltages across the three elements obtained in (c) is greater than the supplied voltage ?

OR

The primary coil of an ideal step-up transformer has 100 turns and the transformation ratio is also 100. The input voltage and power are 220 V and 1100 W respectively. Calculate :

(i)   number of turns in the secondary

(ii)   the current in the primary

(iii)   voltage across the secondary

(iv)   the current in the secondary

(v)   power in the secondary

26.   What is interference of light ? Write two essential conditions for sustained interference pattern to be produced on the screen.   5

Draw a graph showing the variation of intensity versus the position on the screen in Young's experiment when (a) both the slits are opened and (b) one of the slits is closed.

What is the effect on the interference pattern in Young's double slit experiment when:

(i)   screen is moved closer to the plane of slits ?

(ii)   separation between two slits is increased. Explain your answer in each case.

OR

What is diffraction of light ? Draw a graph showing the variation of intensity with angle in a single slit diffraction experiment. Write one feature which distinguishes the observed pattern from the double slit interference pattern.

How would the diffraction pattern of a single slit be affected when :

(i)   the width of the slit is decreased ?

(ii)   the monochromatic source of light is replaced by a source of white light ?

27. With the help of a neat and labelled diagram, explain the underlying principle and working of a moving coil galvanometer. What is the function of :

    (i)   uniform radial field   5

    (ii)   soft iron core

in such a device ?

<p align="center">OR</p>

Derive a mathematical expression for the force per unit length experienced by each of the two long current carrying conductors placed parallel to each other in air. Hence define one ampere of current.

Explain why two parallel straight conductors carrying current in the opposite direction kept near each other in air repel ?

<p align="center">QUESTION PAPER CODE 55/1</p>

1. Define the term electric dipole moment. Is it a scalar or a vector quantity ?   1

2. The variation of potential difference V with length l in case of two potentiometers P and Q is as shown. Which one of these two will you prefer for comparing emfs of two primary cells ?   1
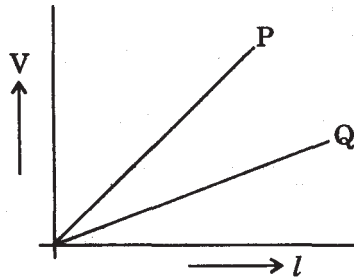
3. de Broglie wavelength associated with an electron accelerated through a potential difference V is λ. What will be its wavelength when the accelerating potential is increased to 4 V ?   1

4. Give any one difference between FAX and e-mail systems of communication.   1

5. Steel is preferred for making permanent magnets whereas soft iron is preferred for making electromagnets. Give one reason.   1

6. You are given 'n' resistors, each of resistance 'r'. These are first connected to get minimum possible resistance. In the second case, these are again connected differently to get maximum possible resistance. Compute the ratio between the minimum and maximum values of resistance so obtained.   2

<p align="center">129</p>

7. Two capacitors of capacitance $6\,\mu F$ and $12\,\mu F$ are connected in series with a battery. The voltage across the $6\,\mu F$ capacitor is 2 V. Compute the total battery voltage. 2

OR

A parallel plate capacitor with air between the plates has a capacitance of 8 pF. The separation between the plates is now reduced by half and the space between them is filled with a medium of dielectric constant 5. Calculate the value of capacitance of the capacitor in the second case. 2

8. Draw a labelled ray diagram to show the image formation in a refracting type astronomical telescope. Why should the diameter of the objective of a telescope be large ? 2

9. Draw a circuit diagram using a metre bridge and write the necessary mathematical relation used to determine the value of an unknown resistance. Why cannot such an arrangement be used for measuring very low resistances ? 2

10. Which one of the two, an ammeter or a milliammeter, has a higher resistance and why ? 2

11. An alternating voltage of frequency f is applied across a series LCR circuit. Let f_r be the resonance frequency for the circuit. Will the current in the circuit lag, lead or remain in phase with the applied voltage when (i) $f > f_r$, (ii) $f < f_r$? Explain your answer in each case. 2

12. A point charge 'q' is placed at O as shown in the figure.

Is $V_P - V_Q$ positive or negative when (i) $q > 0$, (ii) $q < 0$? Justify your answer. 2

13. Using Gauss's theorem, show mathematically that for any point outside the shell, the field due to a uniformly charged thin spherical shell is the same as if the entire charge of the shell is concentrated at the centre. Why do you expect the electric field inside the shell to be zero according to this theorem ? 3

14. Distinguish between frequency modulation and amplitude modulation. Why is an FM signal less susceptible to noise than an AM signal ? 3

15. Write the order of frequency range and one use of each of the following electromagnetic radiations : 3
    (i) Microwaves
    (ii) Ultra-violet rays
    (iii) Gamma rays

16. Sketch a graph between frequency of incident radiations and stopping potential for a given photosensitive material. What information can be obtained from the value of the intercept on the potential axis ?

A source of light of frequency greater than the threshold frequency is placed at a distance of 1 m from the cathode of a photo-cell. The stopping potential is found to be V. If the distance of the light source from the cathode is reduced, explain giving reasons, what change will you observe in the

   (i)   photoelectric current,

   (ii) stopping potential.   3

17. Define the terms half-life period and decay constant of a radioactive substance. Write their S.I. units. Establish the relationship between the two.   3

18. A neutron is absorbed by a ^6_3Li nucleus with the subsequent emission of an alpha particle.

   (i)   Write the corresponding nuclear reaction.

   (ii) Calculate the energy released, in MeV, in this reaction.   3

   Given : mass ^6_3Li = 6·015126 u; mass (neutron) = 1·0086654 u;
           mass (alpha particle) = 4·0026044 u and mass (triton) = 3·0100000 u.
           Take 1 u = 931 MeV/C².

19. When an inductor L and a resistor R in series are connected across a 12 V, 50 Hz supply, a current of 0·5 A flows in the circuit. The current differs in phase from applied voltage by $\pi/3$ radian. Calculate the value of R.   3

OR

A 0'5 m long metal rod PQ completes the circuit as shown in the figure. The area of the circuit is perpendicular to the magnetic field of flux density 0·15 T. If the resistance of the total circuit is 3Ω , calculate the force needed to move the rod in the direction as indicated with a constant speed of $2\ ms^{-1}$.   3
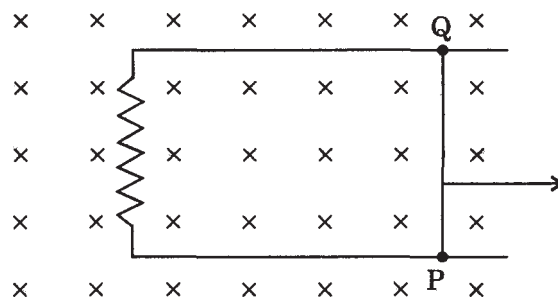
20. State Faraday's laws of electrolysis. Express these in mathematical notation. Name any two applications of electrolysis. 3

21. What are eddy currents ? How are these produced ? In what sense are eddy currents considered undesirable in a transformer and how are these reduced in such a device ? 3

22. A beam of light converges to a point P. A lens is placed in the path of the convergent beam 12 cm from P. At what point does the beam converge if the lens is
    (a) a convex lens of focal length 20 cm,
    (b) a concave lens of focal length 16 cm ?
    Do the required calculations. 3

23. Consider an optical communication system operating at $\lambda \sim 800\,nm$. Suppose, only 1% of the optical source frequency is the available channel band-width for optical communication. How many channels can be accommodated for transmitting
    (a) audio-signals requiring a band-width of 8 kHz,
    (b) video TV signals requiring an approximate band-width of 4.5 MHz ?
    Support your answer with suitable calculations. 3

24. Explain (i) forward biasing, (ii) reverse biasing of a P-N junction diode. With the help of a circuit diagram, explain the use of this device as a half-wave rectifier. 3

25. Draw a neat and labelled diagram of a cyclotron. State the underlying principle and explain how a positively charged particle gets accelerated in this machine. Show mathematically that the cyclotron frequency does not depend upon the speed of the particle. 5

OR

State the Biot-Savart law for the magnetic field due to a current carrying element. Use this law to obtain a fonriula for magnetic field at the centre of a circular loop of radius R carrying a steady current I. Sketch the magnetic field lines for a current loop clearly indicating the direction of the field. 5

26. What are coherent sources of light ? State two conditions for two light sources to be coherent.

Derive a mathematical expression for the width of interference fringes obtained in Young's double slit experiment with the help of a suitable diagram. 5

OR

State Huygens' principle. Using the geometrical construction of secondary wavelets, explain the refraction of a plane wavefront incident at a plane surface. Hence verify SnelFs law of refraction.

Illustrate with the help of diagrams the action of (i) convex lens and (ii) concave mirror on a plane wavefront incident on it. 5

27. What are energy bands ? How are these formed ? Distinguish between a conductor, an insulator and a semiconductor on the basis of energy band diagram. 5

OR

Explain the function of base region of a transistor. Why is this region made thin and lightly doped ?

Draw a circuit diagram to study the input and output characteristics of n-p-n transistor in a common emitter (CE) configuration. Show these characteristics graphically. Explain how current amplification factor of the transistor is calculated using output characteristics. 5

Marking Scheme — Physics

EXPECTED ANSWERS/VALUE POINTS

1.   Dielectric constant of a medium may be defined as the ratio of capacitance of a
      capacitor with dielectric between its plates to its capacitance with its plates separated
      in vacuum.

      Or $K = \dfrac{C}{C_0}$

      C = Capacitance with dielectric as medium.

      C_o = Capacitance with vaccum as medium.   1 marks

                                                                    Total : 1 marks

2.
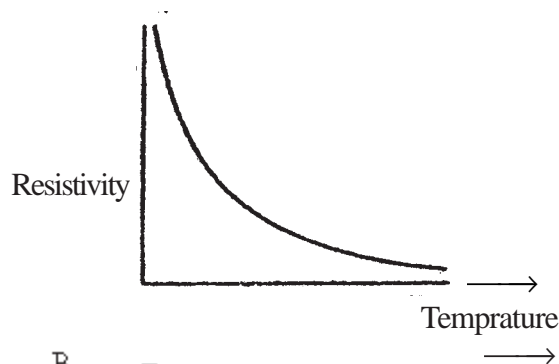
                                                                    Total : 1 mark

3. $\tan \theta = \dfrac{B_v}{B_H} = \sqrt{3}$ ½ mark

      $\theta = 60°$ or $\dfrac{\pi}{3}$ radians   or $\tan^{-1}\sqrt{3}$ ½ mark

      (Full credit to be given if the candidate writes the correct answer without
      calculation.)

                                                                    Total : 1 mark

4.   Demonstration of wave nature of electrons

                    OR

      Demonstration of dual nature of matter

                    OR

      Moving electrons can behave like a wave.

                    OR

      Moving electrons exhibit diffraction

                                                                    Total : 1 mark

5.   Digital Communication   **Total : 1 mark**

6.
$$E = \frac{1}{4\pi\varepsilon_0} \frac{q}{r^2} \quad \text{............................. (i)}$$

½ mark

$$V = \frac{1}{4\pi\varepsilon_0} \frac{q}{r} \quad \text{............................. (ii)}$$

$$\therefore \quad q = \frac{V^2}{E}.4\pi\varepsilon_0$$

$$= \frac{10 \times 10}{20} \times \frac{1}{9 \times 10^9} \, C$$

$$= \frac{5}{9} \times 10^{-9} \, C$$

1½ marks

OR

Dividing equation (ii) by (i)

$$r = \frac{V}{E} = \frac{10}{20} = 0.5 \text{m}$$

½ mark

Substituting the value of r in (i) or (ii) and solving

1½ marks

$$q = \frac{5}{9} \times 10^{-9} \, C$$

Total : 2 marks

7.
> Relation – 1
>
> Description of charge carriers – ½ mark in each case

(i) $\quad \mu = \frac{V_d}{E}$

1 mark

(ii) (a) ions/positive and negative ions

½ mark

(b) electrons/positive ions/electrons and positive ions

½ mark

Total : 2 marks

8.
> Principle – 1
>
> Any two uses – ½ + ½

Principle of working:

A charged particle experiences a force in an electric field and gets accelerated.

It then enters in uniform magnetic field acting at right angles to its direction of
motion and follows a circular path with constant speed.

1 mark

Uses : (i)   For accelerating charged particles

(ii)   For implanting ions into solids and for studying their properties and synthesizing new materials.

(iii)   For producing radioactive substances used in diagnosis and treatment.

(Any two)   ½+½ = 1 mark

Total : 2 marks

9.

> Diagram – 1 ½
>
> Advantage – ½

Labelled Ray Diagram
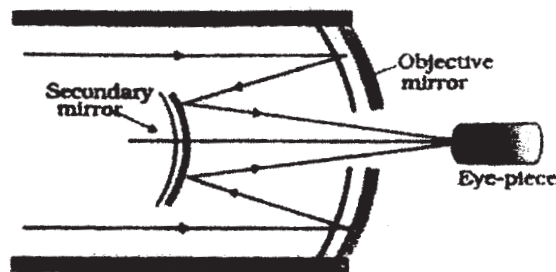
1½ mark

(if arrows on rays are not shown deduct ½ marks)

Advantage :

No chromatic aberration/ more light gathering power/large size mirror can be more easily obtained than the lens (Any One)   ½ mark

Total : 2 marks

10.

> (i)   Drawing Wave Form   1
>
> (ii)   Explanation   1

If the candidate considers it as a circuit containing diode

Wave form:
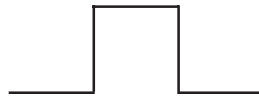
1 mark

Explanation: When the input voltage is +5v , the diode, being forward biased , conducts and output is obtained across R. When the input is –5v, the diode being reverse biased does not conduct and hence there is no output.   1 mark

Alternatively,

If the candidate considers it as a circuit with NOT gate

Wave form:
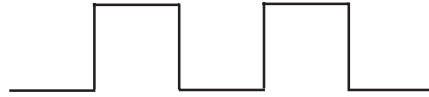
1 mark

Explanation: When the input is zero, NOT gate conducts and output is obtained across R

When the input is 5V there will be no output.

Alternatively,

If the candidate considers it just as an arrow showing the direction of current, the output will have the wave form similar to input.

Output waveform
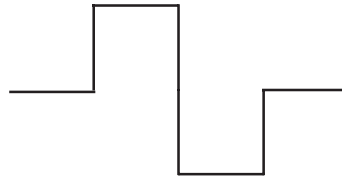
2 mark

OR

(i)   In forward biasing , the depletion layer decreases.   ½ mark

Reason : Majority charge carriers come closer to junction/Explanation by diagram   ½ mark

(ii)   In reverse biasing the width of depletion layer increases   ½ mark

Reason : The majority charge carries go farther away from the junction/Explanation by diagram.   ½ mark

Total : 2 marks

11.

> Correct identification of two lines   — ½ + ½
>
> Finding $C_2 = 2C_1$ — ½
>
> Reason — ½

Line A represents C_2 ½ mark

Line B represents C_1 ½ mark

$$\because \quad C = \frac{A\varepsilon_o}{d}$$

$$\therefore \quad C_2 = 2C_1$$ ½ mark

Also slope of line $\dfrac{q}{V} = C$ ½ mark

Line A, of greater slope, corresponds to C_2 while line B corresponds to C_1

Total : 2 marks

138

12.

| Finding emf – ½ |
| Finding net resistance – ½ |
| Finding current – ½ |
| Finding current through 3 Ω — ½ |

Net emf of combination of Cells = 9V - 5V = 4V   ½ mark

Net resistance of the circuit $= 0.3 + 1.2 + \dfrac{6 \times 3}{(6+3)} + 4.5 = 8\Omega$ ½ mark

Current $I = \dfrac{E_{net}}{R_{net}} = \dfrac{4}{8} = 0.5A$ ½ mark

Let the current through 3Ω resistance be I_1.

$3\,I_1 = 6\,(I - I_1)$

$I_1 = \dfrac{1}{3}A = 0.333A$ ½ mark

(Alternatively, solve it by using Kirchoff's laws)

Total : 2 marks

13.

(i) Decreases – ½	(ii) Increases – ½
Reason – ½	Reason – ½
(iii) Increases – ½	
Reason – ½	

(i) Decreases   ½ mark

because the magnetic flux linked with the second coil decreases / coupling

between them becomes weaker   ½ mark

(ii) Increases   ½ mark

because magnetic field produced by current carrying coil and its flux linked

with the second coil will increase   ½ mark

Alternatively,

the mutual inductance.

$M = \mu_0 n_1 n_2 Al \Rightarrow$ M is proportional to $n_1 n_2$

(iii) Increases   ½ mark

because magnetic permeability increases   ½ mark

   & $M \,\alpha\, \mu$

Total : 3 marks

14.

> Formula – 1
>
> Finding the correct sign of f, ½ in both cases
>
> Deciding the nature of lens, ½ in both cases

$$\frac{1}{f_m} = \left(\frac{{}_a\mu_g}{{}_a\mu_m} - 1\right)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$$ 1 mark

(i)   For ${}_a\mu_g = 1.5$ and ${}_a\mu_m = 1.6$ ½ mark

f_m will be negative
hence it will be a diverging lens.   ½ mark

(ii)   For ${}_a\mu_g = 1.5$ and ${}_a\mu_m = 1.33$ ½ mark

f_m will be positive
hence it will be a converging lens.   ½ mark

(Alternatively, if explained with the help of ray diagrams full marks should be given)

Total : 3 marks

15.

> Definition of Threshold frequency – ½
>
> Definition of Stopping Potential – ½
>
> Effect + Reason – ½ + ½ in each case

(a)   Threshold frequency :
The minimum frequency of the incident radiation for a given metal below
which emission of photo electrons does not take place.   ½ mark

(b)   Stopping potential :
The minimum negative potential of the anode(collector) for which photo electric
current becomes zero.   ½ mark

(c)   (i)   (Practically) No effect/remain same.   ½ mark
As increase in frequency does not significantly change the number of
photons in the beam.   ½ mark

(ii)   Increases   ½ mark
the number of incident photons increases   ½ mark

Total : 3 maks

140

16.
> For α-decay :
> Nuclear Reaction – ½
> Finding ratio(n/p) before & after reaction – ½ + ½
>
> For β-decay :
> Nuclear Reaction – ½
> Finding ratio(n/p) before & after reaction – ½ + ½

For α-decay

$$^{238}_{92}U \rightarrow\, ^{234}_{90}Th + ^{4}_{2}He + Q$$ ½ mark

(or any other nuclear reaction)

For $^{238}_{92}U$, $\dfrac{n}{p} = \dfrac{238-92}{92} = \dfrac{146}{92} = 1.587$ ½ mark

For $^{234}_{90}Th$, $\dfrac{n}{p} = \dfrac{234-90}{90} = 1.6$

∴ $\dfrac{n}{p}$ increases during α decay.   ½ mark

For β-decay

$$^{60}_{27}Co \rightarrow\, ^{60}_{28}Ni + ^{0}_{-1}e + Q$$ ½ mark

(or any other nuclear reaction)

For $^{60}_{27}Co$, $\dfrac{n}{p} = \dfrac{60-27}{27} = 1.22$ ½ mark

For $^{60}_{28}Ni$, $\dfrac{n}{p} = \dfrac{60-28}{28} = 1.14$

∴ $\dfrac{n}{p}$ decreases during β decay   ½ mark

Alternatively,
Full credit to be given if explained in terms of

$$^{A}_{Z}X \rightarrow\, ^{A-4}_{Z-2}Y + ^{4}_{2}He$$

and $$^{A}_{Z}X' \rightarrow\, ^{A}_{Z+1}Y' + ^{0}_{+1}e + \overline{v}(v)$$
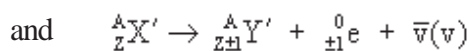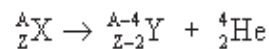
for α decay and β decay

Total : 3 marks

17.
> Definition of intrinsic semicondutor – 1
> Conversion   p type – ½
>   n type – ½
> Diagrams – ½ + ½

<u>Intrinsic semi conductor</u> : Pure semi-conductor having no impurities or negligible impurities./ By diagram explanation   1

Conversion into –

(i)   P-type – by doping with small amount of trivalent impurities (or writes a name of element)   ½ mark

(ii)   N-type- by doping with small amount of pentavalent impurity (or writes a name of element)   ½ mark
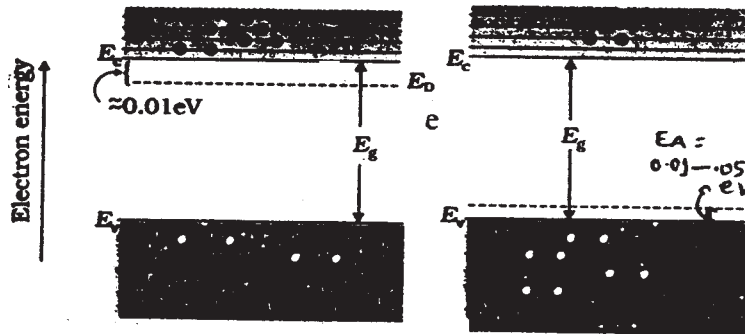
½+½ marks

Total : 3 marks

18. | Explanation of each part —1 ½ + 1 ½ |

(i)   The strong attractive nuclear forces act to bring the nucleons together to form the nucleus. This work is done at the expense of some mass of the (free) nucleons getting converted into energy. This results in a decrease of mass.

Alternatively,

The binding energy needed to hold the nucleons together to form the nucleus, is obtained at the expense of some mass of the (free) nucleons getting converted into energy.   1½ marks

Alternatively,

The forces of attraction, holding the nucleons together to form the nucleus gives the system a negative potential energy which is due to the mass lost in the process of formation of the nucleus.

Alternatively

When the free nucleons are brought together to form the nucleus, some energy gets released. This energy is released at the expense of the some mass of the free nucleons getting converted into energy

(ii)   Even when the total number of neutrons and protons is conserved in a nuclear reaction the sum total of the masses of the products is different(either less or more) than the masses of the reactants. It is the energy equivalent of the mass difference (loss or gain) that gets released or absorbed in the reaction   1½ marks

> Drawing the B.E. Curve - 2
>
> Explanation - 1

(i)
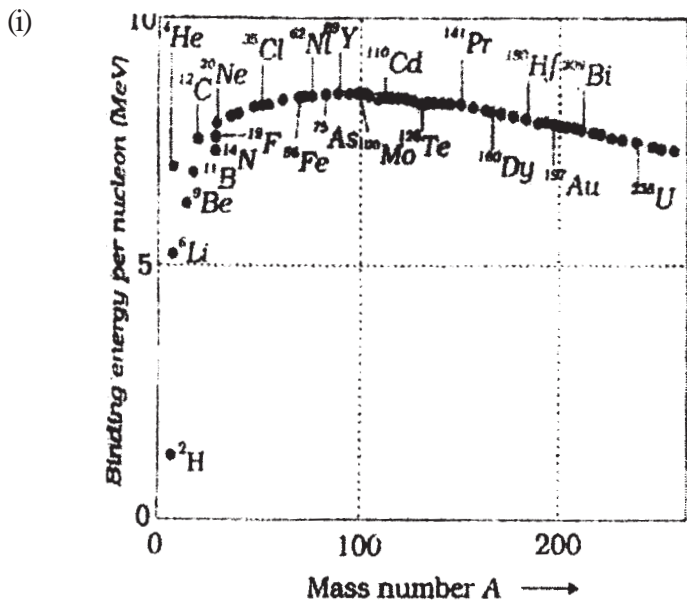
2marks

In case of nuclei of low atomic number, binding energy per nucleon is quite small; when fuse together, they form a nucleus of higher atomic mass and higher B.E./ nucleon, and hence, they release energy and become more stable.   1 mark

Total : 3 marks

19.

> Definition of modulation- ½
>
> Naming the three types – ½ + ½ + ½
>
> Explanation - 1

(a) Modulation : The process in which some characteristic of the carrier wave is varied in accordance with information or message signal.

OR

The process of super imposing a low frequency signal (message or information) over a high frequency wave (carrier wave) to vary some characteristics of the latter.   ½ mark

(a) Types of modulation :

    (a) Amplitude modulation (AM)   ½ mark

    (b) Frequency Modulation (FM)   ½ mark

    (c) Phase Modulation (PM)   ½ mark

(b) Meaning of any one of these or explanation of Diagram   1 mark

Total : 3 marks

20.
> Definition of flux- ½
>
> S.I. Units – ½
>
> Derivation - 2

(i) <u>Electric Flux</u> : Total number of electric lines of force crossing a certain area
normally.   ½ mark

<div align="center">OR</div>

The surface integral of electric field over a closed surface

<div align="center">OR</div>

$$\phi = \oint_s \vec{E} . d\vec{s}$$ ½ mark

(i) <u>S.I. Units</u> : Nm^2/C or V-m   ½ mark

(ii)
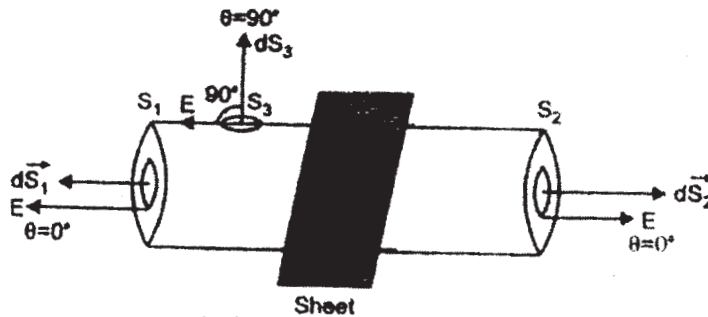
½ mark

Derivation : $\phi = \oint_s \vec{E} . d\vec{s} = \dfrac{q}{\varepsilon_0}$ ½ mark

$2EA = \dfrac{\sigma A}{\varepsilon_0}$ ½ mark

$\therefore \ E = \dfrac{\sigma}{2\varepsilon_0}$ ½ mark

(½ mark may be awarded if the student gives the statement of Gauss' theorem only)

Total : 3 marks

21.
> Calculation of potential gradient – 2
>
> Calculation of unknown emf – 1

Current $I = \dfrac{5}{480 + 20} = 0.01A$ ½ mark

$\therefore$ p.d. across the wire$(dV) = IR = 0.1 \times 20 = 0.2V$ ½ mark

potential gradient $(\Delta V) = \dfrac{dV}{dx} = \dfrac{0.2 \text{ V}}{10 \text{ m}} = 0.02 Vm^{-1}$ ½+½ mark

E.M.F. of the cell $\varepsilon = \Delta V \times balancing\,length$ 1 mark

$$= 0.02 \times 6 = 0.12 \text{ V}$$

Total : 3 marks

22.

> Circuit Diagram –1
> Current gain –1
> Voltage gain –1

(i)   Circuit Diagram
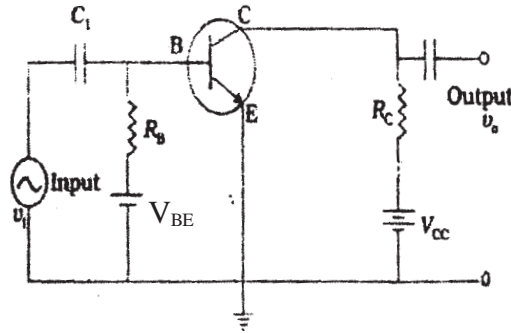
1 mark

(ii) Current Gain $(\beta) = \dfrac{\Delta I_c}{\Delta I_b}$　　　　　　　　　　½ mark

$= \dfrac{2 \times 10^{-3}}{10 \times 10^{-6}} = 200$　　　　　　　　　　½ mark

(iii) Voltage Gain $= \beta \times \dfrac{r_o}{r_i}$　　　　　　　　　　½ mark

$= 200 \times \dfrac{5 \times 10^3}{1000} = 1000$　　　　　　　　　　½ mark

Total : 3 marks

23.

> Definition of Critical Frequency-1
>
> Formula – 1
>
> Calculation - 1

(i)   **Critical frequency :** The maximum frequency of the wave beyond which
      ionosphere cannot reflect them due to total internal reflection　　　1 mark

(ii) $f_c = 9\left(N_{max}\right)^{1/2}$　　　　　　　　　　1 mark

$\therefore \quad \dfrac{N_{1max}}{N_{2max}} = \dfrac{f_1^{\,2}}{f_2^{\,2}} = \dfrac{10^2}{8^2} = \dfrac{100}{64} = \dfrac{25}{16}$　　　　　　1 mark

Total : 3 marks

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24.
> Diagram – 1 ½
>
> Explanation – 1 ½

(i) Labeled diagram :
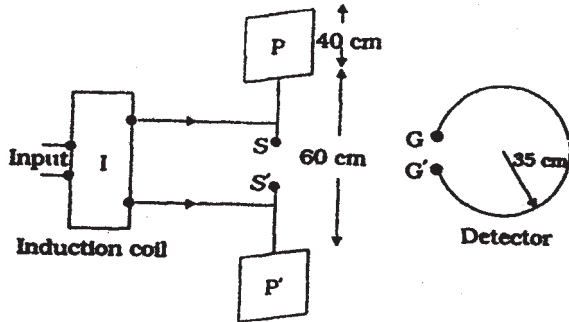
1½ marks

Explanation: The interrupting currents in the induction coils produces sudden high voltage across S and S' which ionizes the air in the gap creativity electrons and ions. These electrons and ions oscillate back and forth between S and S' and produce oscillating electric and magnetic fields in mutually perpendicular directions. This results in production of e.m. waves.

1½ marks

Total : 3 marks

25.
> (a) Calculation of resonance frequency –1
>
> (b) Impedance – ½
>   Current (rms) – ½
>   Current (peak) – ½
>
> (c) Calculation of rms potential across the three elements- ½ + ½ + ½
>
> (d) Explanation -1

(a) Resonance Frequency $\nu = \dfrac{1}{2\pi\sqrt{LC}}$

½ mark

$$= \dfrac{1}{2\pi\sqrt{5\times80\times10^{-6}}}$$

$$= \dfrac{25}{\pi}\,\text{Hz} \quad\text{or}\quad 7.95\,\text{Hz}$$

½ mark

(b) At resonance,
     Impedance , $Z = R = 40\,\Omega$

½ mark

$$I_{ms} = \dfrac{V_{ms}}{Z} = \dfrac{230}{40} = 5.75\,\text{A}$$

½ mark

∴   Current amplitude $= I_{rms}\sqrt{2} = 8.13\,\text{A}$

½ mark

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(c) $V_R = I_{rms}R = 5.75 \times 40 = 230$ V   ½ mark

$V_L = I_{rms}X_L = 5.75 \times 2\pi\nu\, L = 1437.5V$ ½ mark

$V_c = I_{rms}X_c = 5.75 \times \dfrac{1}{2\pi\nu c} = 1437.5V$ ½ mark

(d) V_L and V_C are 180° out of phase. Hence net voltage across their combination
       $(V_L - V_C)$: The net supply voltage is obtained by using   1 mark

$V_{LCR} = \sqrt{V_R^2 + (V_L - V_C)^2} = V$

and this is less than the sum $V_R + V_L + V_C$

Total : 5 marks

OR

For Each Part
Formula and Calculation – ½ + ½
$(1 \times 5 = 5)$

(i) $\dfrac{N_s}{N_p} = 100 \therefore N_s = N_p \times 100 = 10,000$ ½+½ mark

(ii) $I_p = \dfrac{P}{V_p} = \dfrac{1100}{220} = 5A$ ½+½ mark

(iii) $\dfrac{V_s}{V_p} = \dfrac{N_s}{N_p} , \therefore V_s = 220 \times 100 = 22000V$ ½+½ mark

(iv) $\dfrac{I_s}{I_p} = \dfrac{N_p}{N_s} , \therefore I_s = \dfrac{5}{100} = 0.05A$ ½+½ mark

       or $\left(\dfrac{V_s}{V_p} = \dfrac{I_p}{I_s} \right)$

(v)   For ideal transformer   ½+½ mark
       input power = output power = 11000W

(Full credit should be given even if the candidate calculates values directly.

Total : 5 marks

26.

(a) **Interference of light:**

The phenomenon of redistribution (non- uniform) of light energy in the medium due to super-position of two coherent sources of light.   1 mark

(b) **Conditions**

   (i)   Wave lengths/ frequency of the two waves should be same.   ½ mark

   (ii) Phase difference between the two waves should be zero or constant in time   ½ mark

(c) Diagram :   (i)   both slits are open   ½ mark

                   (ii) one slit open   ½ mark
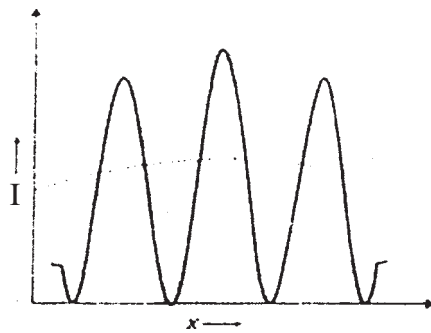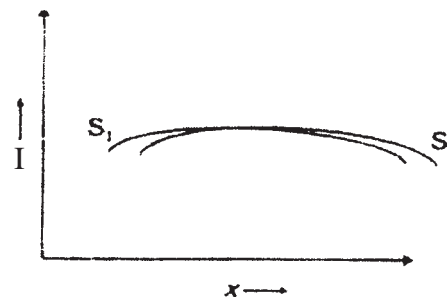
        (i)   (ii)

(d) (i)   The fringe width decreases   ½ mark

           As fringe width $\omega \propto D$ ½ mark

     (ii) The fringe width decreases   ½ mark

           As fringe width $\omega \propto 1/d$ ½ mark

Total : 5 marks

OR

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Diffraction: The phenomenon of bending of light round sharp corners spreading into the regions of geometrical shadow.   1 mark

<div align="center">Or</div>

Presence of light in geometrically forbidden regions

<div align="center">Or</div>

Presence of light in regions forbidden as per the straight line or rectilinear propagation of light.
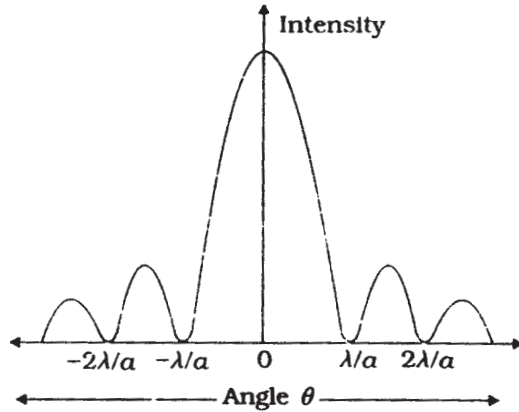
1 mark

(c) **Distinguishing Feature :**   1 mark

   In interference fringes are equally spaced (have the same fringe width) where as single slit diffraction they are not.

<div align="center">Or</div>

   In interference the bright fringes formed are of the same intensity where as in single slit diffraction experiment these are of varying intensity.

<div align="center">Or</div>

   In interference, minimum intensity (minima) are perfectly dark whereas in single slit diffraction experiment they are not.   or any other correct answer

(d) (i)   Width of central maxima increases   1 mark

   (ii)   Diffraction pattern will be coloured with the principal maxima having a
          central white part surrounded by different coloured hues.   1 mark

<div align="right">**Total : 5 marks**</div>

27.

| Diagram –1 |
| Principle-1 |
| Working – 2 |
| Functions – ½ + ½ |

(a) Labeled diagram :
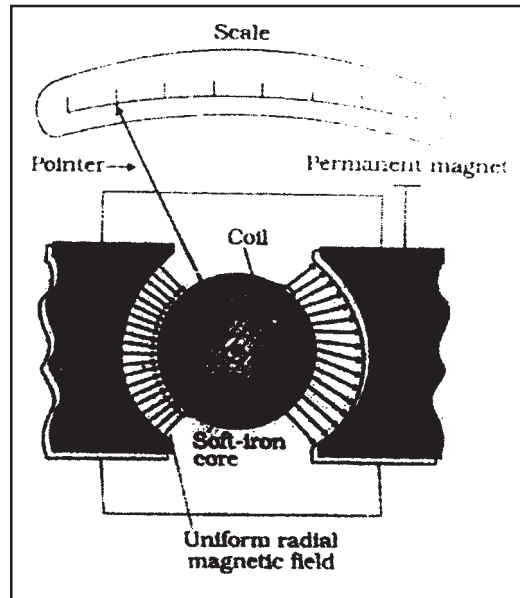
1 mark

Principle: When a current carrying coil is placed in a magnetic field it experiences a torque. 1 mark

Explanation of working 2 marks

Function :

(i) In the radial magnetic field, the plane of the coil always remain parallel or along the direction of magnetic field lines. ½ mark

(ii) To concentrate the lines of force of the magnetic field through the coil. ½ mark

Total : 5 marks

OR

Diagram –1
Derivation – 2
Definition of ampere –1
Reason –1

(a) Diagram :
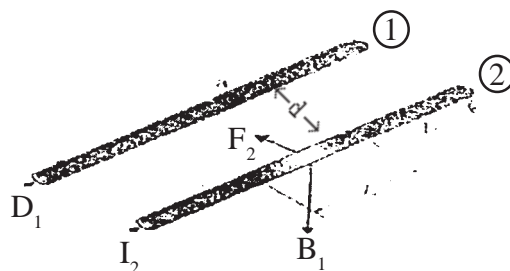
1 marks

(b) Magnetic field due to the current I_1 flowing in conductor 1 at a point on conductor 2

$$B_1 = \frac{\mu_0 I_1}{2\pi \ d}$$ ½ mark

∴ force on conductor 2 due to B_1 is

$$F_2 = I_2(\vec{\ell_2} \times \vec{B_1})$$ ½ mark

$$= I_2 \ell_2 \times B_1$$ ½ mark

$$\therefore \frac{F_2}{\ell_2} = \frac{\mu_0 I_1 I_2}{2\pi d}$$ ½ mark

(c) ampere : The equal currents, flowing through two thin long straight parallel conductors said to be one ampere each if they interact with each other with a force of 2×10^{-7} N/m when kept one metre apart in vacuum. 1 mark

(d) Direction of magnetic field, at the second conductor, due to current in the first conductor. ½ mark

Direction of force on the second conductor, (carrying a parallel current) due to this magnetic field. ½ mark

(Give full credit if the candidates explains it by diagram)

Total : 5 marks

EXPECTED ANSWERS/VALUE POINTS

1.

> Definition – ½
>
> Vector – ½

It is the product of charge (q) and the seperation (2a) between the pair of charges

Alternatively,

In terms of $p =$ Torque/normal electric field ½ mark
It is a vector quantity. ½ mark
Total : 1 mark

2. Potentiometer Q **Total : 1 mark**

3.
| Formula – ½ |
| Calculation – ½ |

$$\lambda = \frac{h}{\sqrt{2meV}} \quad \text{or} \quad \frac{12.27}{\sqrt{V}} A^0$$ ½ mark

$$\lambda' = \frac{12.27}{\sqrt{4V}} A^0 \quad \text{or} \quad \frac{\lambda}{2}$$ ½ mark

(Full marks should be awarded, if calculation is given without formula)

Total : 1 mark

4. Electronic reproduction of a document at a distant place is known as a FAX.

In e-mail, message can be created and processed. Message can be stored but FAX does not have these facilities.

(give full credit for statement of any one difference or definition of FAX or definition of e-mail.)

Total : 1 mark

5. Steel has Higher retentivity/ Higher coercivity/ Higher permeability/ Large area of (B-H curve)

Alternatively, Soft iron has lower retentivity / Lower coercivity/ Lower permeability/ Smaller area of (B-H curve).

Total : 1 mark

6.
| Calculation of R_{min} and R_{max} — ½ + ½ |
| Ratio — 1 |

$$R_{min} = \frac{r}{n}$$ ½ mark

$$R_{max} = nr$$ ½ mark

$$\frac{R_{min}}{R_{max}} = \frac{1}{n^2}$$ 1 mark

Total : 2 marks

7.
| Formula – ½ |
| Calculation of V_2– ½ |
| Calculation of V_1– 1 |

$C_1 V_1 = C_2 V_2$ ½ mark
Calculation of $V_2 = 1V$ ½ mark
$V = V_1 + V_2 = 3V$ 1 mark
Alternatively,
Calculation of equivalent capacitance $= 4\mu f$ 1 mark
$4 \times$ Battery Voltage $= 6 \times 2$ ½ mark
$\therefore$ Battery Voltage $= 3$ V ½ mark

Total : 2 marks

Or

Formula – ½
Substitution – ½
Calculation – 1

$$c = \frac{A\varepsilon_0\varepsilon_r}{d} \quad or \quad \frac{k\varepsilon_0 A}{d}$$

½ mark

$$c = 5 \times \frac{\varepsilon_0 A}{d/2}$$

½ mark

$$c = 10\left(\frac{A\varepsilon_0}{d}\right) = 10 \times 8 = 80pf$$

1 mark

Total : 2 marks

8.

Labelling- ½
Diagram - 1
Reason – ½

1½ marks

  OR
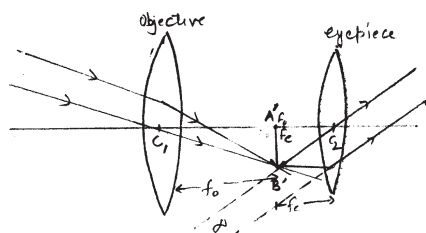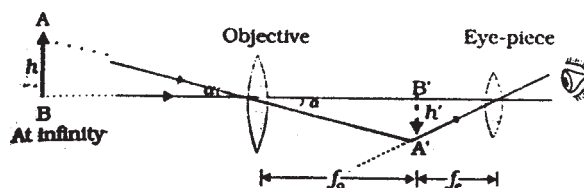
High resolving power/ Large light gathering power/ Intensity of image more
(any one)   ½ mark

Total : 2 marks

9.

Circuit Diagram – 1
Formula – ½
Reason - ½

1 mark

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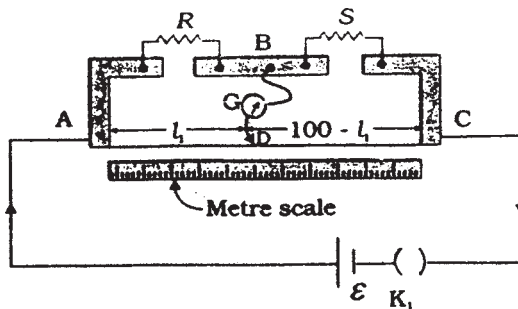
$$R = \frac{\ell_1}{(100 - \ell_1)} S$$

½ mark

End correction can be comparable with the low resistance used **or** unknown contact resistance (strips of connecting wires) becomes comparable with low resistance to be measured.

½ mark

Total : 2 marks

10.

Milliammeter – 1

Reason — 1

Milliammeter has a higher resistance.

1 mark

It has higher value of shunt resistance comparable to ammeter.

1 mark

Total : 2 marks

11.

(i) Current lags – ½   Reason – ½

(ii) Current leads – ½   Reason – ½

(i) $f > f_r$, current lags behind voltage/voltage leads current

½ mark

Circuit becomes inductive $(X_L > X_C)$

½ mark

(ii) $f < f_r$, current leads voltage/ voltage lags current.

½ mark

Circuit becomes capacitive $(X_C > X_L)$

½ mark

Total : 2 marks

12.

(i) Positive – ½   Reason – ½

(ii) Negative – ½   Reason – ½

(i) $q > 0$ $V = \frac{kq}{r}$

Since $V \propto \frac{1}{r}$, $V_P > V_Q$

1 mark

$\therefore V_P - V_Q$ is +ve

(ii) $q < 0$, $V_P < V_Q$

$\therefore V_P - V_Q$ is –ve

1 mark

(full credit should be given, if the explanation is given in terms of work done to bring a unit positive charge from infinity to the given point).

Total : 2 marks

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13.

$$\phi = \oint_{s} \vec{E}.\,\vec{ds} = \frac{q}{\varepsilon_0}$$
<div align="right">½ mark</div>
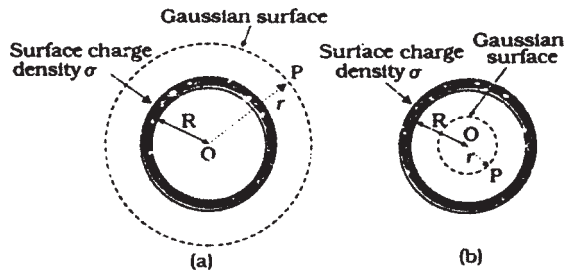
Gaussian surface
Surface charge density σ
Gaussian surface
Surface charge density σ
(a)   (b)
<div align="right">½ mark</div>

Derivation : $E \times 4\pi r^2 = \dfrac{\sigma}{\varepsilon_o} 4\pi R^2$
<div align="right">1 mark</div>

$\therefore\ E = \dfrac{\sigma R^2}{\varepsilon_0 r^2} = \dfrac{q}{4\pi\varepsilon_0 r^2}$
<div align="right">½ mark</div>

where $q = 4\pi R^2\sigma$ is the total charge on the spherical shell.
<div align="right">½ mark</div>

Electrostatic field is zero, since total charge inside the shell is zero **or** charge reside on the surface of the shell.

<div align="right">**Total : 3 marks**</div>

14.

Amplitude Modulation – In this mode of modulation the amplitude of the carrier signal varies in accordance with the modulating signal.
<div align="right">1 mark</div>

Frequency Modulation - In this mode of modulation the frequency of the carrier signal varies in accordance with the modulating signal.
<div align="right">1 mark</div>

Reason: Noise is generally in terms of amplitude variations only.
<div align="right">1 mark</div>

<div align="right">**Total : 3 marks**</div>

15.
> Range + Application – ½ + ½
> In each case (1 × 3 = 3)

(i)   Microwaves- frequency range 10^9 to 10^{12} Hz.   ½ mark

Application –Radar system/aircraft navigation/microwave ovens(any one)   ½ mark

(ii)   UV Rays – Frequency range 10^{14} to 10^{17} Hz   ½ mark

Application – Purification of water / Preservation of food items.   ½ mark

(iii)   Gamma rays – Frequency range 10^{18} to 10^{22} Hz   ½ mark

Application – Nuclear reactions.   ½ mark

(If the students mention any correct value of frequency within the above ranges, give full credit for the marks allotted for range of values)

Total : 3 marks

16.
> Graph - ½
> Information obtained - ½
> Correct mention of change & reason – ½ + ½
> In each case (1 × 2 = 2)
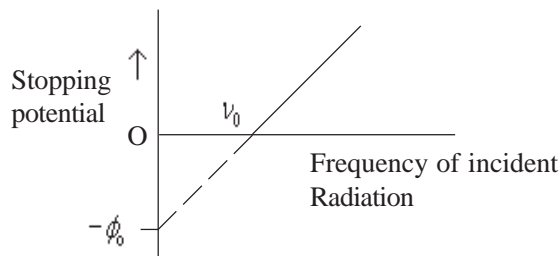
     ½ mark

Work function **or**   ½ mark

(i)   Photoelectric current increases, due to increase of intensity.   ½+½ mark

(ii)   No change, as stopping Potential is independent of intensity.   ½+½ mark

Total : 3 marks

17.
> Definition + unit - ½ + ½ in each case (1 × 2 = 2)
> Derivation – 1

Half life – It is the time at which number / amount of radioactive nuclei/sample at any time reduces to one half its initial value.   ½ mark

     Unit – second   ½ mark

Decay constant – It is the ratio of the rate at which the number of atoms will decay to the total number of atoms present at that time.   ½ mark

     Or

It is the reciprocal of time in which the radioactive sample reduces to $\left(\dfrac{1}{e}\right)^{th}$ of its initial value.   ½ mark

     Unit – second^{-1} ½ mark

Derivation :

$$N(t) = N_o e^{-\lambda t}$$

$$R = -\frac{dN}{dt} = \lambda N_o e^{-\lambda t} \quad \text{............................ (1)}$$

$$N = \frac{N_o}{2} \quad \text{at} \quad t = T_{\frac{1}{2}}$$

$$\therefore \quad T_{\frac{1}{2}} = \frac{\log_e 2}{\lambda} = \frac{0.693}{\lambda} \qquad \qquad \text{1 mark}$$

(If only the relation is stated, award ½ mark only)

Total : 3 marks

18.

| Reaction – 1 |
| Calculation – 1 + 1 |
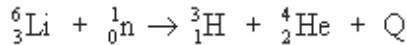
$${}^{6}_{3}\text{Li} + {}^{1}_{0}\text{n} \rightarrow {}^{3}_{1}\text{H} + {}^{4}_{2}\text{He} + Q \qquad \qquad \text{1 mark}$$

$\Delta m = (\text{mass of } {}^{6}_{3}\text{Li} + \text{mass of neutrons}) - (\text{mass of } \alpha \text{ particle} + \text{mass of } {}^{3}_{1}\text{H})$ 1 mark

$\Delta m = 0.011187u$

Energy released $Q = \Delta m \times 931$ \qquad 1 mark

$\qquad \qquad = 10.415$ MeV.

Total : 3 marks

19.

| Formula – ½ |
| Calculation of Z – 1 |
| Formula for Phase difference – ½ |
| Calculation of R — 1 |

Method – I

$$Z = \frac{E}{I} \qquad \qquad \text{½ mark}$$

Calculation of Z = 24Ω \qquad 1 mark

$$\text{Cos}\phi = \frac{R}{Z} \qquad \qquad \text{½ mark}$$

Calculation of R= 12Ω \qquad 1 mark

Method – II

$$Z = \frac{E}{I} \qquad \qquad \text{½ mark}$$

Z= 24Ω \qquad 1 mark

$$\tan\phi = \frac{X_L}{R} \qquad \qquad \text{½ mark}$$

R = 12Ω \qquad 1 mark

Total : 3 marks

> Formula – ½
>
> Calculation of I – 1
>
> Formula for force – ½
>
> Calculation of force — 1

Method I

$$E = B \, l \, v$$ ½ mark

$$I = \frac{Blv}{R} = I = 0.05A$$ 1 mark

$$F = B \, I \, l$$ ½ mark

Calculation of $F = 3.75 \times 10^{-3}$ N 1 mark

Method II

> Obtaining formula for force – 1 ½
>
> Calculation of force – 1 ½

$$F = \frac{B^2 \, l^2 \, v}{R}$$ 1½ mark

Correct substitution and calculation of $F = 3.75 \times 10^{-3}$ N 1½ mark

Total : 3 marks

20.
> Statements of the two laws – ½ + ½
>
> Mathematical forms – ½ + ½

Faraday's first law : The mass of the substance liberated at an electrode during electrolysis is directly proportional to the total quantity of charge passing through the electrolyte . ½ mark

$$m = Zq \quad \textbf{or} \quad Z \, I \, t$$ ½ mark

Faraday's second law : The masses of different substances, liberated by the passage of the same quantity of charge, are directly proportional to their chemical equivalents or equivalent masses. ½ mark

$$\frac{m_1}{m_2} = \frac{E_1}{E_2}$$ ½ mark

Applications : Electroplating / Extraction of metals from ores / Purification of metals / Electrolytic Capacitor (any two). ½ + ½ mark

Total : 3 marks

21.

> Eddy current – 1
> Production – 1
> Correct reasons/ method – ½ + ½

Eddy current : When magnetic flux linked with a metallic sheet changes, the induced current produced in it, are known as eddy currents.   1 mark

Production : Production due to flux changes, a current is induced in the plate which seeks a path of least resistance and there by flows along irregularly shaped loops.   1 mark

Undesirable – Due to heating effect   ½ mark

Reduction – Laminated core   ½ mark

Total : 3 marks

22.

> Formula –1
> Correct sign of u and f – ½
> Calculation of v – ½
>   In each case
> $(1 \times 2 = 2)$

$\dfrac{1}{f} = \dfrac{1}{v} - \dfrac{1}{u}$ 1 mark

For convex lens   u = 12 cm   1 mark

Calculation   f = + 20 cm   v = 7.5 cm

For the concave lens u = +12 cm   1 mark

          f = -16 cm then v = 48 cm

Total : 3 marks

23.

> Calculation of frequency of system- ½
> Available Band width – ½
> Calculation of number of channels = 1 in each case
> $(1 \times 2 = 2)$

Calculation of frequency

$f = \dfrac{c}{\lambda} = \dfrac{3 \times 10^8}{8 \times 10^{-7}} = 3.75 \times 10^{14} \text{Hz}.$ ½ mark

Bandwidth = 3.75×10^{12} Hz.   ½ mark

$\text{No. of channels} = \dfrac{3.75 \times 10^{12}}{8 \times 10^3} = 4.69 \times 10^8$ 1 mark

$\text{No. of channels} = \dfrac{3.75 \times 10^{12}}{4.5 \times 10^6} = 8.33 \times 10^5$ 1 mark

Total : 3 marks

24.
Brief Explanation of forward and reverse biasing ½ + ½
Circuit diagram – 1
Explanation -1

Forward bias : We apply a voltage v such that n-side is negative and p-side is positive (Diode conducts current)

Reverse bias : We apply a voltage v such that n-side is positive and p-side is negative. (Diode is cut off).

<center>Or</center>

Any other point relevant to forward bias/reverse bias should also be given full marks. (Explanation with /without circuit diagram)   ½+½ mark
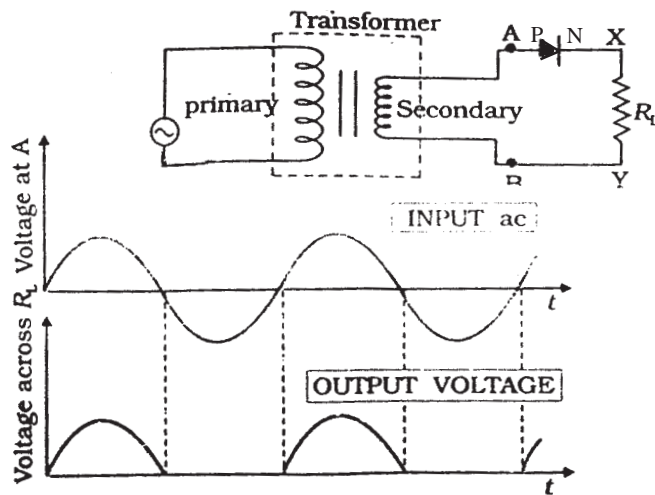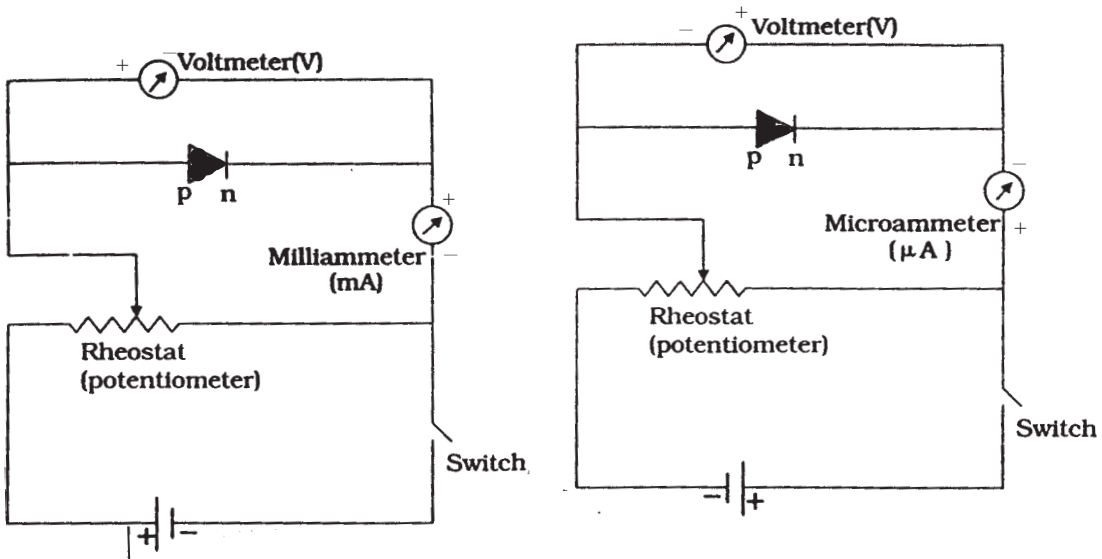
Explanation : When the voltage at A is +ve, the diode is forward biased and it conducts. When A is negative, the diode is reverse biased and its does not conduct. Therefore, in the positive half cycle there is a current through the load resistor and we get an output voltage as shown in figure. But there is negligibly small current in the negative half cycle and hence no output. Thus, the output voltage, though still varying, is restricted to one direction only.   1 mark

Total : 3 marks

25.

Diagram – 1
Principle – 1
Explanation – 1
Derivation – 2
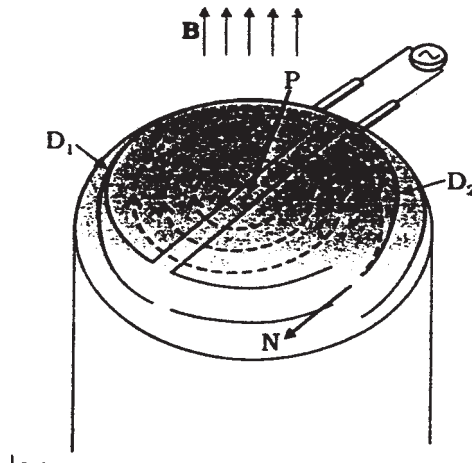
1 mark

Principle : A charged particle experiences a force in an electric field and gets accelerated. It then enters the uniform magnetic field acting at right angles to its direction of motion and follows a circular path with constant speed.   1 mark

Explanation : The positive ions moves towards the dee which is negative at the instant. Because of the transverse magnetic field it moves in a circular path. By the time it comes to the edge of the dees, the polarity gets reversed and the ion is accelerated again towards the other dee. The process is repeated.   1 mark

$$B qv = \frac{mv^2}{r} \qquad \therefore r = \frac{mv}{Bq}$$

$$v = w_c r, \quad \therefore r = \frac{mw_c r}{qB}$$

$$w_c = \frac{qB}{m}$$

$$f_c = \frac{qB}{2\pi m}, \text{ where } f_c \text{ cyclotron frequency}$$ 2 marks

Total : 5 marks

OR

Statement – 1
Derivation – 3
Magnetic Field Lines -1

Statement :- The magnitude of the magnetic field dB at any point, due to a current carrying conductor, is directly proportional to the current 'I' the element length 'dl' and inversely proportional to the square of the distance 'r' . Its direction is perpendicular to the plane containing 'dl' and r.
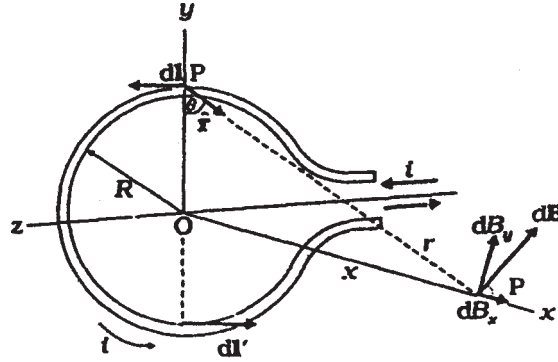
1 mark

$$\vec{dB} = \frac{\mu_0}{4\pi} \frac{I \mid d\vec{\ell} \times \vec{r} \mid}{r^3}$$

$$dB = \frac{\mu_0}{4\pi} \frac{Idl}{\left(x^2 + R^2\right)} \qquad \cos\theta = \frac{R}{\left(x^2 + R^2\right)^{1/2}}$$

$$dB_x = \frac{\mu_0 I}{4\pi} \frac{Rd\ell}{\left(x^2 + R^2\right)^{3/2}}$$

$$B = B_x \hat{i} = \frac{\mu_0 IR^2}{2\left(x^2 + R^2\right)^{3/2}} \hat{i}$$

$$\therefore \quad B_0 = \frac{\mu_0 I}{2R} \hat{i}$$

3 marks
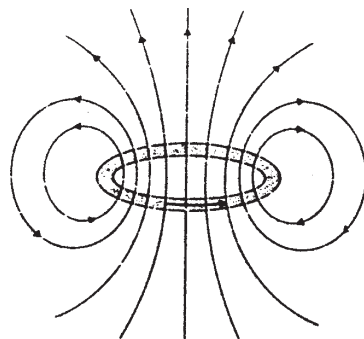
1 mark

(also accept the direct derivation of the field at the centre of the coil.

Total : 3 marks

162

26.

Those sources which emit light with a constant (or zero) phase difference or have a time independent constant phase difference.   1 mark

Conditions : (1) Same wavelength/ Frequency   ½+½ mark

            (2) Phase difference at that point should be constant in time.
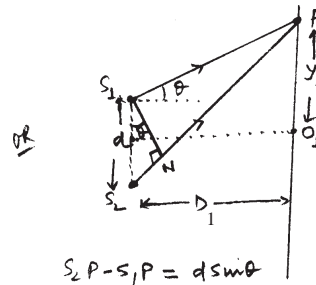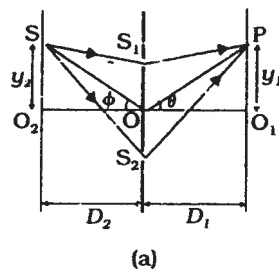
(a) $S_2P - S_1P = d\sin\theta$ 1 mark

$S_2P - S_1P = S_2P = d\sin\theta$

$\approx d\tan\theta \approx \dfrac{dy_1}{D_1}$

$S_2P - S_1P = \dfrac{dy_1}{D_1} = n\lambda$

$\Rightarrow y_1 = \dfrac{nD_1\lambda}{d}$

The separation between two successive maxima is found by subtracting the values of y_1 for $(n+1)^{th}$ and n^{th} maxima

$$\therefore \ \Delta y_1 = \frac{D_1\lambda}{d}(n+1-n) = \frac{D_1\lambda}{d}$$

$$\therefore \ \beta = \frac{D\lambda}{d}$$
        2 marks

Total : 5 marks

OR

Every point on the given wavefront acts as a fresh source of new disturbance, called secondary wavelet, which travel in all directions with the velocity of light.

A surface, touching these secondary wavelets tangentially in the forward direction at any instant (or forming the envelop of these secondary wavelets) gives new wavefront at that instant.   ½+½ mark

Medium 1

B   A   P   i   O   C   R

Medium 2

(ii)

(c)
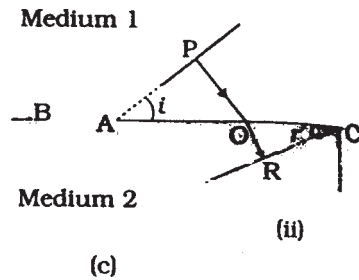
1 mark

Calculate the time taken to travel between the two wavefronts along any ray.

$$\text{time taken from P to R} = \frac{PO}{v_1} + \frac{OR}{v_2}$$

$$= \frac{OA}{v_1}\sin i + \frac{(AC-OA)\sin r'}{v_2}$$

$$= \frac{AC\sin r'}{v_2} + OA\left[\frac{\sin i}{v_1} - \frac{\sin r'}{v_2}\right]$$

2 marks

The coefficient of OA should be independent of time, hence it is equal to zero.

$$\therefore \frac{\sin i}{\sin r'} = \frac{v_1}{v_2} = \mu_{21}$$

1 mark

(b)   (c)
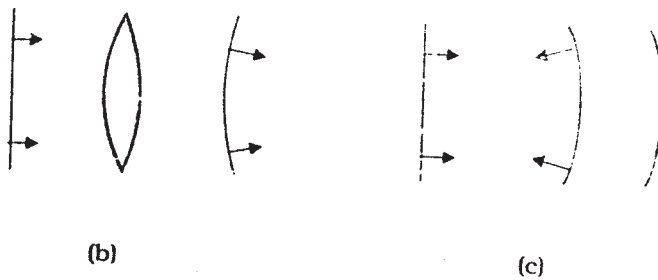
Total : 5 marks

27.

| Meaning- ½ |
| Formation of bands- 1 ½ |
| Energy band diagrams for the three cases – 1+1+1 |

A collection of closely spaced energy levels is called an energy band.   ½ mark

Region D
4N States
0 Electrons

Region C

Region B

Region A →
(isolated atoms)

6N States
2N Electrons

6N States $l=1$
2N Electrons

Gap

2N States $l=0$
2N Electrons

Energy gap = E_g

Region C

4N States
4N Electrons

2N States
2N Electrons

8N States
4N Electrons

Relative energy of electrons →

Actual spacing

$l = n-2$ } $(n-1)^{th}$
$l = 0$ } shell

Assumed spacing →
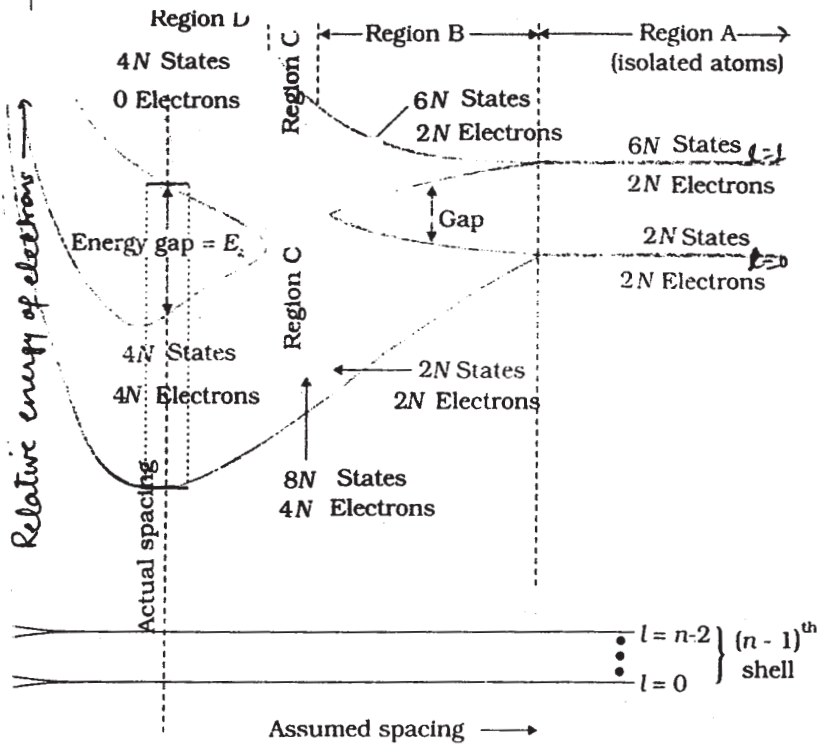
1½ marks

The energies of electrons in the outermost orbit may change due to the interaction between the electrons of different atoms. The 6 N states for $l = 1$, which originally had identical energies in the isolated atoms, spread out and form an energy band.

At still smaller spacings, the energy bands again split apart and are separated by an energy gap Eg The total no. of available energy states 8N get re-apportioned between the two bands(4N states each in the lower and upper energy bands)

Electron energies

Overlapping
conduction band

$(E_g \approx 0)$

E_v

Valence
band

(a)   Metal (band-overlap)

Electron energies

E_c

Empty
conduction
band

$E_g > 3$ eV

E_v

Valence
band

(b)   Insulator

1+1+1 marks

Electron energies

E_c

$E_g < 3$ eV

E_v
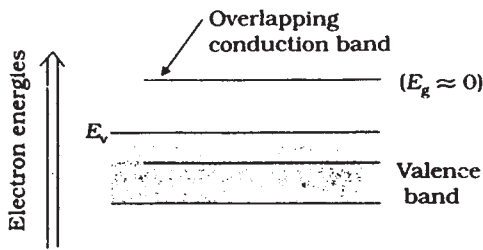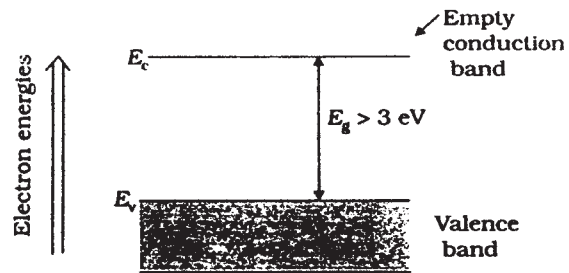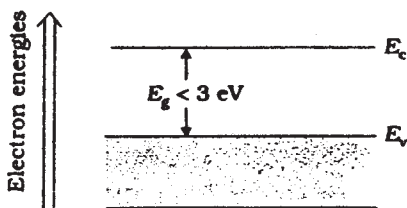
(c)   Semiconductor

Total : 5 marks

165

> Function – ½
>
> Reason – ½
>
> Circuit Diagram – 2
>
> Input/Output characteristics – ½ + ½
>
> Current Amplification Factor - 1

Its acts as interface between emitter and collector. or It controls/regulates the charge carriers moving from emitter to collector.   ½ mark

To minimise base current or ensuring that most of current carriers, moving out of the emitter, move directly from emitter to collector.   ½ mark

(a)
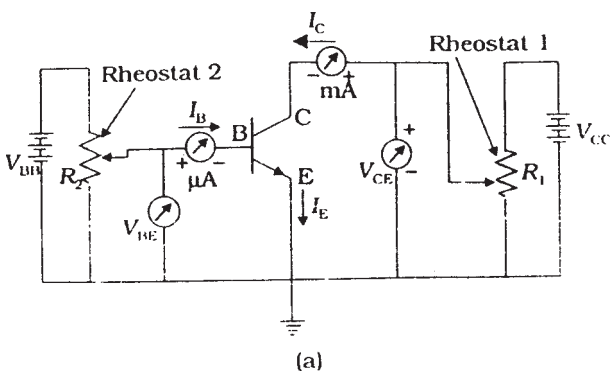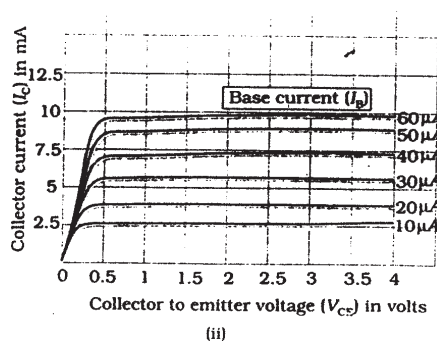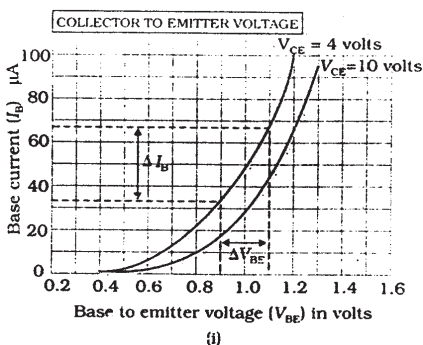
2 marks

½+½ marks

Current amplification factor: This is defined as the ratio of the change in collector current (output current) to the change in base current.   1 mark

$$\beta = \left(\frac{\Delta I_c}{\Delta I_B}\right)_{V_{cB}}$$

Total : 5 marks

CHEMISTRY (Theory)

Time allowed : 3 hours   *Maximum Marks : 70*

GENERAL INSTRUCTIONS :

(i)   All questions are compulsory.

(ii)   Marks for each question are indicated against it.

(iii) Question numbers 1 to 5 are very short-answer, carrying 1 mark each. Answer these in one word or about one-sentence each.

(iv)   Question numbers 6 to 12 are short-answer, carrying 2 marks each. Answer these in about 30 words each.

(v)   Question numbers 13 to 24 are short-answer questions of 3 marks each. Answer these in about 40 words each.

(vi)   Question numbers 25 to 27 are long-answer questions of 5 marks each. Answer these in about 70 words each.

(vii) Use Log Tables, if necessary. Use of calculators is not permitted.

QUESTION PAPER CODE 56/1/1

1.   A cubic solid is made of two elements X and Y. Atoms Y are at the corners of the cube and X at the body centre. What is the formula of the compound ?   1

2.   Two liquids A and B boil at 145°C and 190°C respectively. Which of them has a higher vapour pressure at 80°C ?   1

3.   For the reaction $A \rightarrow B$, the rate of reaction becomes twenty seven times when the concentration of A is increased three times. What is the order of the reaction ?   1

4.   Write the IUPAC name of : $CH_3.CH(Br)CH_2CONHCH_3$.   1

5.   Give a chemical test to distinguish between aniline and N-methyl aniline.   1

6.   (a)   Draw the structure of XeF_2 molecule.   1
     (b)   Write the outer electronic configuration of Cr atom (Z=24).   1

7.   What is meant by entropy driven reaction ? How can a reaction with positive changes of enthalpy and entropy be made entropy driven ?   2

8. Write balanced chemical equations for the following reactions : 2

(a) $Ca_3P_2 + H_2O \rightarrow$

(b) $XeF_6 + 3H_2O \rightarrow$

9. Write chemical equations for the reactions involved in the manufacture of potassium permanganate from pyrolusite ore. 2

10. What are enantiomers ? Draw the structures of the possible enantiomers of 3 methyl pent-1-ene. 2

11. Write the reactions and the conditions involved in the conversion of :

(a) Propene to 1-Propanol 1

(b) Phenol to Salicylic acid 1

12. Write the structures of monomers used in the preparation of : 2

(a) Teflon   (b) PMMA

OR

(a) How does vulcanization change the character of natural rubber ? 1

(b) Why are the numbers 66 and 6 put in the names of nylon-66 and nylon-6 ? 1

13. State Heisenberg's uncertainty principle. An electron has a velocity of $50 \, ms^{-1}$ accurate upto 99.99%. Calculate the uncertainty in locating its position (Mass of electron $= 9.1 \times 10^{-31}$ kg, $h = 6.6 \times 10^{-34}$ J.S.) 1,2

14. An element has a body centered cubic structure with a cell edge of 288 pm. The density of the element is $7.2 \, gcm^{-3}$. Calculate the number of atoms present in 208 g of the element. 3

15. (a) Why is the vapour pressure of a solution of glucose in water lower than that of water ? 1

(b) A 6.90 M solution of KOH in water contains 30% by mass of KOH. Calculate the density of the KOH solution

[Molar mass of $KOH = 56 \, g \, mol^{-1}$] 2

16. Answer the following in brief :

(a) Which of the two isomers of butane is more stable at 25°C and why ? Given [n-butane $(\Delta_f H° = -120 \, kJ \, mol^{-1})$ and isobutane $(\Delta_f H° = -130 \, kJ \, mol^{-1})$] 1

(b) For the change $H_2O(l) \rightarrow H_2O(g)$, predict the sign of ΔS. 1

(c) For the reaction $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$ predict whether work is done by the system or on the system and why ? 1

17. The rate of a particular reaction triples when temperature changes from 50°C to 100°C. Calculate the activation energy of the reaction.

$[\log 3 = 0.4771; R = 8.314 \, JK^{-1} \, mol^{-1}]$ 3

18. (a) How can a colloidal solution and true solution of the same colour be distinguished from each other ?   1

    (b) List four applications of adsorption.   2

OR

Explain the following observations :

    (a) Lyophilic colloid is more stable than lyophobic colloid.   1

    (b) Coagulation takes place when sodium chloride solution is added to a colloidal solution of ferric hydroxide.   1

    (c) Sky appears blue in colour.   1

19. Name the chief ore of silver. Describe with chemical equations the extraction of silver from this ore.   3

20. (a) Using valence bond theory predict the geometry and magnetic behaviour of $[Cr(NH_3)_6]^{3+}$ ion $[Cr = 24]$.   2

    (b) Write IUPAC name of :

    $[Pt(NH_3)_2Cl_2]$ 1

21. (a) The isotope of $^{235}_{92}U$ decays in 14 steps, by loss of 8 α-particles and 6 β-particles. What are mass number and atomic number of the end product ?   1

    (b) Write the equation for the complete reaction $^{56}_{26}Fe$ (D, α).   1

    (c) How is the nuclear binding energy related to the stability of the nucleus ?   1

22. (a) Describe the following giving suitable examples :   2

    (i) Cannizzaro reaction   (ii) Aldol condensation

    (b) Give a chemical test to distinguish between ethanal and propanal.   1

23. Account for the following :

    (i) Electrophilic substitution in case of aromatic amines takes place more readily than benzene.   1

    (ii) CH_3CONH_2 is a weaker base than $CH_3CH_2NH_2$.   1

    (iii) Nitrocompounds have higher boiling points than hydrocarbons having almost same molecular mass.   1

24. Define the following and give one example of each
   (a) Tranquillizers   1
   (b) Mordant   1
   (c) Hybrid rocket propellants   1

25. (a) Explain why electrolysis of aqueous solution of NaCl gives H_2 at cathode
       and Cl_2 at anode. Write overall reaction.   2

   $E°_{Na^+/Na} = -2.71V; E°_{H_2O/H_2} = -0.83V$

   $E°_{Cl_2/2Cl^-} = +1.36V, E°_{H^+ + O_2/H_2O} = 1.23V$)

   (b) Calculate the emf of the cell $Zn/Zn^{2+}(0.1M)||Cd^{2+}(0.01M)/Cd$ at
       298K, [given $E°_{Zn^{2+}/Zn} = -0.76V$ and $E°_{Cd^{2+}/Cd} = -0.40V$]   3

                                        OR

   (a) Account for the following :
       (i) Alkaline medium inhibits the rusting of iron.   1
       (ii) Iron does not rust even if the zinc coating is broken in a galvanized
            iron pipe.   1

   (b) $Cu^{2+} + 2e^- \rightarrow Cu \quad E° = +0.34V$
       $Ag^+ + 1e^- \rightarrow Ag \quad E° = +0.80V$

       (i) Construct a galvanic cell using the above data.
       (ii) For what concentration of Ag^+ ions will the emf of the cell be zero at
            25°C, if the concentration of Cu^{2+} is 0.01M ?
            [log 3.919 = 0.593]   3

26. Give reasons for the following :
   (a) Molten aluminium bromide is poor conductor of electricity.   1
   (b) Nitric oxide becomes brown when released in air.   1
   (c) PCl_5 is ionic in nature in the solid state.   1
   (d) Ammonia acts as a ligand.   1
   (e) Sulphur disappears when boiled with an aqueous solution of sodium
       sulphite.   1

                                        OR

   Name the principal ore of tin or lead. Describe the different steps (along with
   equations for the reactions) involved in the extraction of the metal from the ore
   named. Name an important alloy of each, tin and lead.   2½, 2½

27. (a) State two main differences between globular proteins and fibrous proteins. 2
    (b) Based on their chemical composition, state how are lipids classified Give
        one example of each class. 3

OR

(a) 'Hormones are chemical messengers.' Explain 2

(b) Name the main disease caused due to lack of the vitamin and its source in
    each of the following : A, B_6 and E. 3

QUESTION PAPER CODE 56/1

1. Name the non-stoichiometric point defect responsible for colour in alkali halides. 1

2. Define 'mole fraction' of a substance in a solution. 1

3. A reaction is 50% complete in 2 hours and 75% complete in 4 hours. What is the
   order of the reaction ? 1

4. Write the IUPAC name of $CH_3COCH_2COCH_3$. 1

5. Give a chemical test to distinguish between a primary and a secondary amine. 1

6. Account for the following :
   (i) N_2 has higher bond dissociation energy than NO. 1
   (ii) N_2 and CO both have same bond order but CO is more reactive than N_2. 1

7. At absolute zero, an exothermic reaction is always spontaneous but at temperatures
   above absolute zero, we have to consider both enthalpy and entropy before we
   can predict spontaneity. Why ? 2

8. Write the chemical equations involved in the preparation of the following : 2
   (i) XeF_4
   (ii) H_3PO_3

9. Why is the +2 oxidation state of manganese quite stable, while the same is not true
   for iron ? [Mn = 25, Fe = 26] 2

10. Differentiate between conformation and configuration in open chain molecules by
    giving one example each. 2

11. Give reasons for the following :
    (a) Ortho-nitrophenol is more acidic than ortho-niethoxyphenol. 1
    (b) Glycerol is used in cosmetics. 1

12. Write the structures of monomers used and one use of each of the following polymers :

    (a) Teflon   1

    (b) Buna-N   1

OR

What are biodegradable polymers ? Give two examples.   2

13. What is meant by dual nature of electrons ? Calculate the energy and wavelength of the photon emitted by hydrogen atom when the electron makes a transition from $n = 2$ to $n = 1$. Given that the ionization potential is 13.6 eV.
$[1 eV = 1.6 \times 10^{-19} J]$ 3

14. Calculate the distance between Na^+ and Cl^- ions in NaCl crystal if its density is $2.165 \, g \, cm^{-3}$. [Molar mass of NaCl = 58.5 $g \, mol^{-1}$; $N_A = 6.02 \times 10^{23} \, mol^{-1}$]   3

15. (a) Urea forms an ideal solution in water. Determine the vapour pressure of an aqueous solution containing 10% by mass of urea at 40° C.
(Vapour pressure of water at 40° C = 55.3 mm of Hg)   2

    (b) Why is freezing point depression of 0.1 M sodium chloride solution nearly twice that of 0.1 M glucose solution ?   1

16. How is the concept of coupling reactions useful in explaining the occurrence of non-spontaneous thermochemical reactions ? Explain giving an example.   3

17. A certain reaction is 50% complete in 20 minutes at 300 K and the same reaction is again 50% complete in 5 minutes at 350 K. Calculate the activation energy if it is a first order reaction. [R = 8.314 $J \, K^{-1} \, mol^{-1}$; $\log 4 = 0.602$]   3

18. (a) In which of the following does adsorption take place and why ?   1
        (i) Silica gel placed in the atmosphere saturated with water.
        (ii) Anhydrous $CaCl_2$ placed in the atmosphere saturated with water.

    (b) How does BF_3 act as a catalyst in industrial process ?   1

    (c) Give an example of shape-selective catalysis.   1

OR

    (a) What are micelles ? How do they differ from ordinary colloidal particles ? Give two examples of micelles forming substances.   2

    (b) State Hardy-Schulze rule.   1

19. (a) Write the electronic configuration of the element with atomic number 102.   1

    (b) What is lanthanoid contraction ? What is its effect on the chemistry of the
         elements which follow the lanthanoids ?   2

20. (a) Using valence bond theory, predict the shape and magnetic character of
         $[Ni(CO)_4]$. $[Ni = 28]$ 2

    (b) Give one example of application of coordination compounds- in medicine.   2

21. (a) State Group Displacement Law. Calculate the number of α-particles and
         β-particles emitted when $^{238}_{92}U$ changes to $^{206}_{82}Pb$.   2

    (b) What is meant by K-capture in nuclear chemistry ?   1

22. (a) Write the steps and conditions involved in the following conversions :
         (i)   Acetophenone to 2-phenyl-2-butanol   1
         (ii)   Propene to acetone   1

    (b) Give a chemical test to distinguish between Methyl acetate and Ethyl acetate.   1

23. (a) Explain the following giving suitable examples :   2
         (i)   Sandmeyer's reaction
         (ii)   Coupling reaction of a diazonium salt

    (b) Explain the observed K_b order :   1
         $Et_2NH > Et_3N > EtNH_2$ in aqueous solution

24. Define the following and give one example of each :   3
    (a) Antipyretics
    (b) Vat dyes
    (c) Antibiotics

25. (a) State two advantages of H_2 — O_2 fuel cell over ordinary cell.   2.

    (b) Silver is electrodeposited on a metallic vessel of total surface area 900 cm²
         by passing a current of 0.5 amp for two hours. Calculate the thickness of
         silver deposited. [Given : Density of silver = $10.5\,g\,cm^{-3}$,
         Atomic mass of silver = 108 amu, $F = 96,500\,C\,mol^{-1}$]   3

OR

    (a) Give reasons for the following :   2
         (i)   Rusting of iron is quicker in saline water than in ordinary water.
         (ii)   Aluminium metal cannot be produced by the electrolysis of aqueous
            solution of aluminium salt.

(b) Resistance of a conductivity cell filled with 0.1 M KC1 solution is 100 ohm. If the resistance of the same cell when filled with 0.02 M KCl solution is 520 ohms, calculate the conductivity and molar conductivity of 0.02 M KCl solution. Conductivity of 0.1 M KCl solution is 1.29 $S\,m^{-1}$.   3

26. Give reasons for each of the following :

(a) SiF_6^{2-} is known but $SiCl_6^{2-}$ is not known.   1

(b) Sulphur in vapour state exhibits paramagnetic behaviour.   1

(c) PbO_2 is a stronger oxidizing agent than SnO_2.   1

(d) H_3PO_2 acts as a monobasic acid.   1

(e) Bond dissociation energy of F_2 is less than that of Cl_2.   1

OR

(a) Account for the following :

(i) Thermal stability of water is much higher than that of H_2S.   1

(ii) Anhydrous aluminium chloride acts as a catalyst.   1

(iii) White phosphorus is more reactive than red phosphorus.   1

(b) Draw the structures of (i) H_3PO_3 and (ii) $XeOF_4$.   2

27. (a) What are essential and non-essential amino acids ? Give two examples of each.   2

(b) What are the two types of photosynthesis in green plants ? Give the basic equations of photosynthesis.   2

(c) Mention the two products of glycolysis.   1

OR

(a) Define the following terms :   3

(i) Co-enzymes

(ii) Mutation in biomolecules

(iii) Nucleotides

(b) List four main functions of carbohydrates in organisms.   2

Marking Scheme— Chemistry

QUESTION PAPER CODE 56/1/1

EXPECTED ANSWERS/VALUE POINTS

1. XY   1

2. Liquid A   1

3. $n = 3$ / third order   1

4. 3- Bromo – N- methyl butanamide   1

5. Add chloroform and KOH and heat. Aniline forms pungent smelling isocyanide.
    or chemical equation with Aniline (**1 mark may be awarded**).

    If only name of the test i.e carbyl amine test is given, **½ mark may be awarded.**   1

6. (a)

    (b) $3d^5 4s^1$ ½

7. An entropy driven reaction is that reaction in which ΔH is positive but $-T\Delta S$ is numerically large so that the overall value of ΔG becomes $-ve$.   1

    A reaction with $+ve$ changes of enthalpy and entropy can be made entropy driven if **T is made very large.**   1

8. (a) $Ca_3P_2 + 6H_2O \rightarrow 2PH_3 + 3Ca(OH)_2$ 1

    (b) $XeF_6 + 3H_2O \rightarrow XeO_3 + 6HF$ 1

    (if students write partial balanced equations, full marks may be awarded.)

9. (i) $2MnO_2 + 4KOH + O_2 \longrightarrow 2K_2MnO_4 + 2H_2O$ 1

    (ii) At anode : $MnO_4^{2-} \longrightarrow MnO_4^- + e^-$ 1

                                                (or any other suitable reaction)

10. Enantiomers are the stereoisomers in which their mirror images are non superimposable on each other.   1
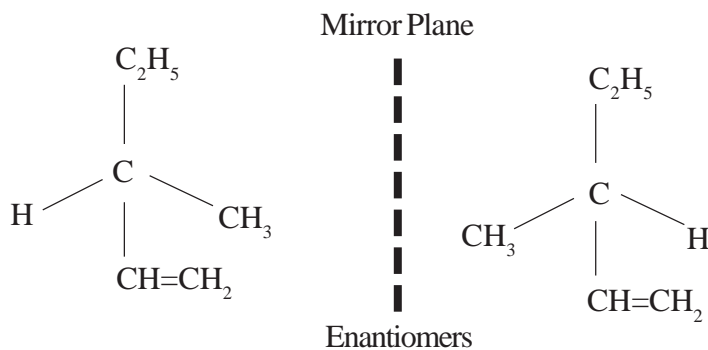
11. (a) $CH_3 - CH=CH_2 \xrightarrow[\text{Peroxide}]{\text{HBr}} CH_3 - CH_2 - CH_2 - Br \xrightarrow{\text{aq. NaOH}}$

                                $CH_3 - CH_2 - CH_2 - OH$ 1

    or

    $CH_3 - CH=CH_2 \xrightarrow{B_2H_6} (CH_3 - CH_2 - CH_2)_3 B \xrightarrow{H_2O_2/OH^-}$

                                $CH_3 - CH_2 - CH_2 - OH$ 1

11. (b)

1

Or

1
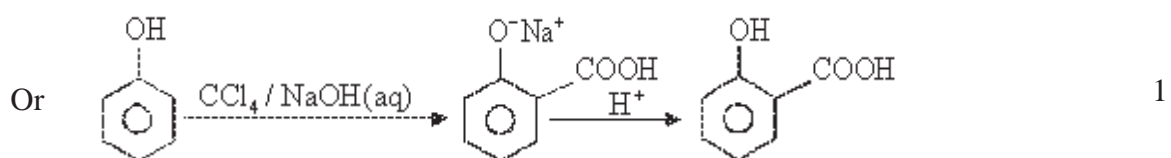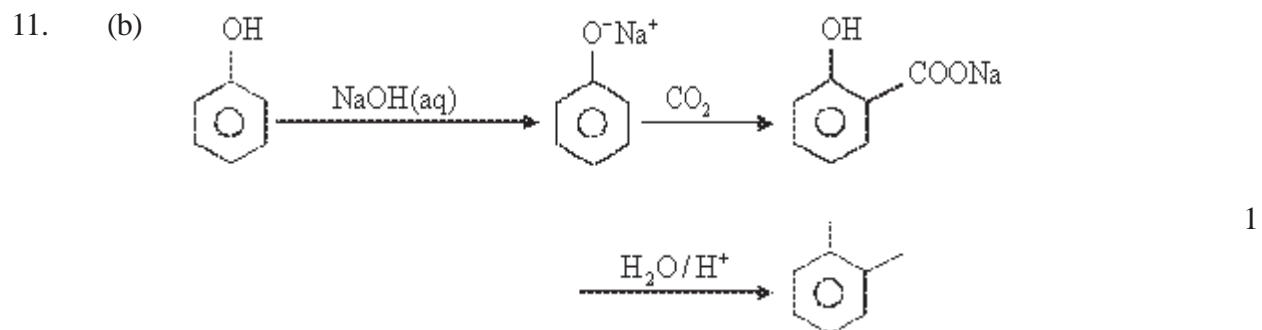
12. (a) (i) Teflon, $CF_2 = CF_2$ 1

(ii) PMMA

$$CH_2 = \overset{\overset{\displaystyle CH_3}{|}}{C} - COOCH_3$$

1

OR

(a) During vulcanization, sulphur cross links are formed which make the rubber
hard.   1

(b) Nylon – 66 is so called because both adipic acid and hexa methylene diamine
contain 6 carbons each . The Nylon –6 implies that all the C_6 units of the
chain are alike.   1

13. Heisenberg's uncertainity principle states that it is not possible to determine
simultaneously the position and velocity of an object at any given instant
accurately.   1

$\Delta x . \Delta p = \Delta x.m. \Delta v = h/ 4 \pi$

$\Delta v = 50 \times .01 \% \ ms^{-1} = 50 \times .01/ 100 = 5 \times 10^{-3} \ ms^{-1}$ 1

$\Delta x = h / 4 \pi m \Delta v = \dfrac{6.6 \times 10^{-34} \ kg \ m^2 \ s^{-1}}{4 \times 3.14 \times 9.1 \times 10^{-31} \ kg \times 5 \times 10^{-3} \ ms^{-1}}$ ½

$\Delta x = 1.15 \times 10^{-2} \ m$ ½

14. Volume of the unit cell $= (2.88 \text{ pm})^3 = (288 \times 10^{-10} \text{ cm})^3$

$$= 2.39 \times 10^{-23} \text{ cm}^3$$

Volume of 208 g of the element $= \dfrac{\text{Mass}}{\text{Density}} = \dfrac{208 \text{ g}}{7.2 \text{ g cm}^{-3}}$

$$= 28.88 \text{ cm}^3 \qquad \qquad 1$$

Number of unit cells in this volume $= \dfrac{28.88 \text{ cm}^3}{2.39 \times 10^{-23} \text{ cm}^3 / \text{unit cell}}$

$$= 12.08 \times 10^{23} \text{ unit cell} \qquad \qquad 1$$

Total no. of atoms $= 12.08 \times 10^{23}$ unit cell $\times 2$ (atom / unit cell)

$$= 2.416 \times 10^{24} \text{ atoms} \qquad \qquad 1$$

OR

$$\rho = \dfrac{Z \times M}{a^3 \times N_A}$$

$$N_A = \dfrac{Z \times M}{a^3 \times \rho} \qquad \qquad 1$$

$$= \dfrac{2 \text{ atoms / unit cell} \times 208 \text{ g}}{(288 \times 10^{-10} \text{ cm})^3 \times 7.2 \text{ g cm}^{-3}} \qquad \qquad 1$$

$$= 2.416 \times 10^{24} \text{ atoms} \qquad \qquad 1$$

15. (a) Glucose is a non volatile solute, so it decreases the vapour pressure of solution / the number of solvent molecules escaping from the surface is reduced resulting in the decrease of vapour pressure of the solvent. 1

(b) Let the density of solution be $= \text{d g cm}^{-3}$

Volume of solution $= 1 \text{ L} = 1000 \text{ cm}^3$ 1

Mass of solution $= (1000 \text{ d}) \text{ g}$

6.90 M solution means l L solution contains 6.90 moles of KOH.

Mass of KOH $= 6.90 \times 56 = 386.4 \text{ g}$ 1

But only 30% of the solution by mass is KOH

$$\dfrac{30}{100} \text{ cm}^3 \times (1000 \text{ d}) = 386.4 \text{ g}$$

$$\text{d} = 1.288 \text{ g cm}^{-3} \qquad \qquad 1$$

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<div align="center">**OR**</div>

Strength $=$ molarity $\times$ mol mass   1

        $= 6.9 \times 56 = 386.4$ g/ L

30 g of solute is present in 100 g of solution

1 g is present in $= \dfrac{100}{30g}$ g of solution   ½

$\therefore$ 386.4 g of solute is present in $= \dfrac{100\,g \times 386.4\,g}{30\,g} = 1288\,g$ of solution

$\therefore$ Density $= \dfrac{mass}{volume} = \dfrac{1288\,g}{1000\,cm^3} = 1.288\,g\,/\,cm^3$ ½

<div align="center">**or**</div>

$M = \dfrac{\% \times d \times 10}{M_B}$ 1

$6.9 = \dfrac{30 \times d \times 10}{56}$ ½

$d = \dfrac{6.9 \times 56}{30 \times 10} = 1.288\,g\,/\,cm^3$ ½

16.   (a)   Isobutane is more stable because its heat content is lower.   1

      (b)   Positive (or +)   1

      (c)   Work is done on the system as there is contraction in volume **or** decrease in

         number of moles ($\Delta n = 2 - 4 = -2$) .   1

17. $T_1 = 50°C = 323K$ $T_2 = 100°C = 373K$

      let rate constant $= k_1$ at 323 K.

      let rate constant $= k_2$ at 373 K

      $\log \dfrac{k_2}{k_1} = \dfrac{Ea}{2.303\,R}\left(\dfrac{T_2 - T_1}{T_1 T_2}\right)$ 1

      when T is 373 K, $k_2 = 3k_1$

      $\log \dfrac{3k_1}{k_1} = \dfrac{Ea}{2.303 \times 8.314}\left(\dfrac{373 - 323}{323 \times 373}\right)$ 1

      $0.4771 = \dfrac{Ea}{2.303 \times 8.314} \times \dfrac{50}{323 \times 373\,J\,mol^{-1}}$

      $Ea = 22011.76\,J\,mol^{-1} = 22.012\,kJ\,mol^{-1}$ 1

<div align="center">**179**</div>

18. (a) When light beam is passed through both the solutions, path of light becomes visible in a colloidal solution (due to scattering of light by colloidal particles). 1

(b) (i) In chromatography for separation of mixtures

(ii) Adsorption of toxic gases by activated charcoal in gas masks.

(iii) Decolourization of cane sugar by animal charcoal

(iv) In heterogeneous catalysis. $4 \times \frac{1}{2} = 2$

(or any other application)

OR

(a) The strong force of attraction between the dispersed phase and the dispersion medium make lyophilic sols more stable. 1

(b) Positive charge on Fe $(OH)_3$ sol particles get neutralised by Cl^- ions from NaCl 1

(c) Due to Tyndall effect **/ or** the suspended particles in the atmosphere scatter the incident light. 1

19. (a) Chief ore of silver : Argentite or Silver glance Ag_2S 1

Treated with sodium cyanide solution. The solution is agitated by passing air through it.

$Ag_2 S + 8 CN^- + O_2 + 2H_2O \rightarrow 4 [Ag(CN)_2]^- + 2S + 4OH^-$ 1

The solution is filtered and then treated with Zinc dust.

$2 [Ag(CN)_2]^- + Zn \rightarrow [Zn(CN)_4]^{2-} + 2 Ag \downarrow$ 1

20. (a) $[Cr (NH_3)_6]^{3+}$

$Cr = [Ar]3d^5 4s^1$

$Cr^{3+} = [Ar]3d^3 4s^0$

$[Cr(NH_3)_6]^{3+} =$ 1

6 pairs of electrons from
$6NH_3$ molecules

Shape – Octahedral or **d^2sp^3** $\frac{1}{2}$

Magnetic behaviour - Paramagnetic $\frac{1}{2}$

(b) diamminedichloroplatinum (II) 1

21. (a) mass number (A) of X $= 235-32 = $ **203**

   atomic number (B) of X $= 92-16+6 = $ **82**　　　　　　　　　　　　　　1

   (b) $^{56}_{26}Fe + {}^{2}_{1}H \longrightarrow {}^{54}_{25}X + {}^{4}_{2}He$　　　　　　　　　　　　　1

   (c) Greater is the binding energy per nucleon , higher will be the stability.　　1

22. (a) (i) Cannizzaro reaction - the reaction in which Aldehydes having no α - hydrogen atom undergo self -reduction and self -oxidation in the presence of concentrated alkali to form Alcohol and Carboxylic acid.

   $2HCHO + KOH$ (conc.) $\rightarrow$ $CH_3OH + HCOO^- K^+$　　　　　1

   (or any other suitable reaction)

   (ii) Aldol Condensation – The reaction in which aldehydes or ketones having at least one α hydrogen undergo condensation in the presence of dilute alkali forming β hydoxy aldehydes or ketones is called Aldol condensation.

   $$2\ CH_3CHO \xrightarrow{\text{dil NaOH}} CH_3-CH-CH_2CHO$$
   $$|$$
   $$OH$$
   　　　　　　　　　　　　　　　　　　　　　　　　　　　　　1

   (or any other suitable reaction)

   (b) Heat both the compounds with I_2 and alkali. **Ethanal gives yellow ppt. of Iodoform**　　　　　　　　　　　　　　　　　　　　　　　　1

   (If only name Iodoform test is mentioned, ½ mark may be awarded)

23. (i) $-NH_2$ group in aromatic amines strongly activates the aromatic ring through delocalization of the lone pair of electrons on nitrogen atom over the benzone ring. However , no such delocalization occurs in case of benzene.　　1

   (or express diagrammatically)

   (ii) In $CH_3 CONH_2$, the lone pair of electrons on nitrogen is delocalized with carbonyl group as a result of which electron density on nitrogen decreases and hence basic character decreases whereas in $CH_3CH_2 NH_2$, ethyl group is electron releasing which makes the amine more basic.　　　　1

   (or express diagrammatically)

   (iii) Because of polar nature of - NO_2 group.　　　　　　　　　　　　1

24. (a) The substances which effect the central nervous system and cure mental diseases are called tranqullizers e.g Luminal / Seconal　　　　　½, ½

   (b) The substances which act as binding agent between the fabric and the dye are called mordants e.g Al $(OH)_3$ / Cr $(OH)_3$/ Tannin etc.　　　½, ½

   (c) They usually consist of a solid fuel and a liquid oxidizer e.g Liquid N_2O_4 + Acrylic rubber.　　　　　　　　　　　　　　　　　　½, ½

25. (a) At cathode - $Na^+ (aq) + 1e^- \rightarrow Na (s)$ $E^O = -2.71V$

$2H_2O (l) + 2e^- \rightarrow H_2 (g) + 2 OH^- (aq)$ $E^O = -0.83 V$
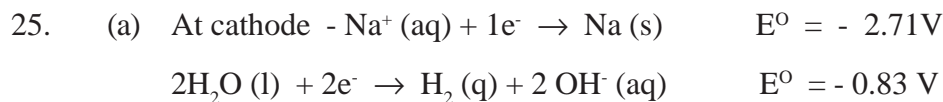
Since $-0.83 V > -2.71V$, standard reduction potential of water is greater
than that of sodium, so reduction of water only takes place and H_2 is liberated   ½

At anode $2Cl^- (aq) \rightarrow Cl_2 (g) + 2 e^-$

             $H_2O (l) \rightarrow ½ O_2 + 2 H^+ + 2e^-$
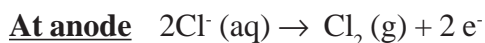
Since Reduction potential of water (1.23 V) is less than that of Cl_2 (1.36),
oxidation of H_2O to O_2 should take place but oxidation of H_2O to O_2 is a
slow process and hence oxidation of Cl^- ions takes place which liberates Cl_2 ½

Overall reaction :

$NaCl (aq) + H_2O (l) \rightarrow Na^+ (aq) + OH^- (aq) + ½ H_2 (g) + ½ Cl_2 (g)$ 1

(b) The cell reaction : $Zn (s) + Cd^{2+} (aq) \rightarrow Zn^{2+} (aq) + Cd(s)$
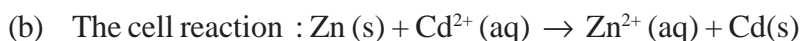
$E°_{cell} = E°_{Cathode} - E°_{anode} = [-0.40 - (0.76)] = 0.36V$ 1

$E_{cell} = E°_{cell} - \dfrac{0.059}{2} \log \dfrac{[Zn^{2+}]}{[Cd^{2+}]}$ 1

$E_{cell} = 0.36 - \dfrac{0.059}{2} \log \dfrac{0.1}{0.01}$

$E_{cell} = 0.36 - 0.0295 \log 10$

$E_{cell} = 0.3305 V$ 1

OR

(a) (i) The presence of OH⁻ furnished by alkaline solution removes H^+ from
the reaction and retards the oxidation of Fe to Fe^{2+}.   1

(ii) Iron does not rust even if zinc coating is broken in a galvanized iron
pipe because in the presence of moisture, air and CO_2, zinc being
more reactive than iron forms an invisible , non reactive layer of basic
zinc carbonate / **or**

$E°_{Zn^{2+}/Zn}$ is lower than that of $E°_{Fe^{2+}/Fe}$, Zn gets oxidized in preference
to iron and inhibits rusting.   1

(b) (i) The cell reaction : $Cu (s) + 2 Ag+ (aq) \rightarrow Cu^{2+} (aq) + 2 Ag (s)$
The cell is

$Cu (s) / Cu^{2+} (aq) || Ag^+ (aq)/ Ag (s)$ 1
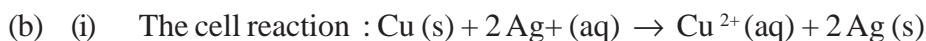
(ii) $E°_{cell} = E°_{Cathode} - E°_{anode} = (0.80 - 0.34) = 0.46V$

$E_{cell} = E°_{cell} - \dfrac{0.059}{2} \log \dfrac{[Cu^{2+}]}{[Ag^+]^2}$ 1

$E_{cell} = E°_{cell} - \dfrac{0.059}{2} \log \dfrac{0.01}{[Ag^+]^2}$

As $E_{cell} = 0$

$\therefore \quad 0 = 0.46 - \dfrac{0.059}{2} \log \dfrac{0.01}{[Ag^+]^2}$

$15.593 = \log \dfrac{0.01}{[Ag^+]^2}$, from which $[Ag^+]$ may be calculated.

26. (a) Because molten aluminium bromide is predominantly a covalent compound. 1

(b) Due to oxidation of NO. 1

or

Due to the formation of NO_2 which is brown in colour

or

$2\ NO\ (g) + O_2\ (g) \rightarrow 2\ NO_2\ (g)$

colourless   Brown
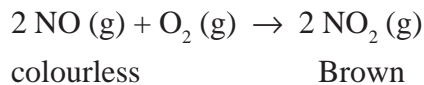
(c) PCl_5 is ionic in solid state because it exists as $[PCl_4]^+ [PCl_6]^-$ 2

(d) Because of the presence of lone pair of electrons on nitrogen. 1

Note : The 1 mark alloted to (e) has been assigned to part (c)

OR

(a) Tin (Sn)

(i) Principal ore : Cassiterite SnO_2 1½

(ii) Concentration – by washing the crushed ore with strong current of
water 1

(iii) Smelting $SnO_2 + 2C \xrightarrow{\Delta} Sn + 2CO(\uparrow)$ 1

Refining : Purification is done by liquation. ½

Alloy of Tin : Bronze (or any other) ½

Alloy of Lead : German Silver , Solder (any one) ½

or

Lead Pb

 (i) Principal ore : Galena PbS   1

 (ii) Concentration : By froth floatation process   1

 (iii) Roasting : $2\,Pb\,S + 3O_2 \xrightarrow{\;\Delta\;} 2\,PbO + 2SO_2$

          $PbS + 2\,O_2 \xrightarrow{\;\;\Delta\;\;} PbSO_4$ 1

 (iv) Reduction : More Galena is added to roasted product and heated to

    get lead metal.   1

      $2PbO + PbS \rightarrow 3\,Pb + SO_2$

         or

     $PbSO_4 + PbS \rightarrow 2Pb + 2SO_2$

         or

    $PbO + C \rightarrow Pb + CO$

 Alloy of lead : German Silver , Solder etc.(any one)   ½

 Alloy of Tin : Bronze (or any other)   ½

27. (a)

Globular Proteins	Fibrous Proteins
(i) They are cross linked condensation products .	(i) They are linear condensation products.
(ii) Three dimensional spherical shape.	(ii) Rod like rigid shape.

                            1+1

 (b) Lipids are naturally occuring compounds related to fatty acids which include
   fats, oils, waxes etc.

  (i) Simple lipids (Homolipids) : e.g neutral fats / waxes.   ½+½

  (ii) Compound Lipids (Hetrolipids) – e.g Phospholopids / Glycolipids ½+½

  (iii) Derived Lipids – fatty acids / fatty alcohols/ steroids / terpenes etc. ½+½

<div align="center">OR</div>

 (a) Hormones transfer information from one group of cells to distant tissue or
   organ. Because of their action as communication among cells, they are called
   Chemical messangers.

 (b)

Name of the Vitamins	Source	Deficiency disease	
Vitamins A	Fish oil, Liver of fresh water fish, rice polishing **(any one)**	Xerophthalmia, nightblindness. **(any one)**	½+½
Vitamins B$_6$	Cereal, grains, egg yolk, yeast, molasses and meat **(any one)**	Severe dermatitis, convulsions **(any one)**	½+½
Vitamin E	Wheat germ oil, cotton seed oil and soybean Oil **(any one)**	Sterility	½+½

EXPECTED ANSWERS/VALUE POINTS

1.   Presence of F- centres.   1

2.   Mole fraction is defined as the number of moles of a component divided by total
       number of moles of all the components present in the solution.   1

3.   First order   1

4.   Pentane - 2, 4 -dione   1

5.   Aromatic primary amine gives orange dye on treating with ice cold $NaNO_2$ +
       HCl followed by β - naphthol whereas secondary amine does not give this test /
       or describe carbyl amine test or Hinsberg test.   1
       (If only name of the test is written, award ½ mark only.)

6.   (i)   B.O of N_2 is 3 and that of NO is 2.5 . Due to higher bond order N_2 has
              higher bond dissociation energy **or** N_2 has a triple bond and NO has a
              double bond and therefore higher bond dissociation energy.   1

       (ii)   Because of higher electronegativity difference, CO is polar and therefore
              more reactive **or any other suitable reason (polarity or heteronuclear
              nature)**   1

7.   As $\Delta G = \Delta H - T\Delta S$

       The process is spontaneous when ΔG is – ve. Since $T = 0$ so $T\Delta S = 0$, i.e
       $\Delta G = \Delta H$. For an exhothermic process, ΔH is –ve, therefore at absolute zero
       ΔG will always be – ve and hence a spontaneous process.   1

       At temp. above absolute zero, ΔS is not zero. It may be + ve or – ve. Hence
       we have to consider both the ΔH and $T\Delta S$ for deciding ΔG and the
       spontaneity.   1

8.   (i) $Xe + 2F_2 \xrightarrow{\text{873K, 7bar}} XeF_4$ 1

       (ii) $PCl_3 + 3H_2O \longrightarrow H_3PO_3 + 3HCl$

                        or

              $P_4O_6 + 6H_2O \rightarrow 4H_3PO_3$ 1

9.   Mn : [Ar] $3d^5 4s^2$; Fe [Ar]$3d^6 4s^2$ ½

       $3d^5$ is more stable than $3d^6$ because half – filled orbitals are more stable than partly
       filled orbitals.   ½

       In the formation of Mn^{2+} $2e^-$ from $4s^2$ are given out, and $3d^5$ is left. In case of Fe^{2+},
       $2 e^-$ from $4s^2$ are given out, and $3d^6$ is left.   1

10.	Conformations	Configuration	
	These spatial arrangement are obtained by rotation of groups around sigma bond. The interconversion of these isomers does not require breaking of bonds.	Configurational isomers are due to certain types of rigidity within the molecules and these isomers can be interconverted only by breaking and re making of covalent bonds and not simply by rotation.	1
	Ex. Staggerd and Eclipsed conformation of ethane.	Ex. D- Glyceraldehyde and L-Glyceraldehyde configurations.	1

One example (either of the two)

(or any other suitable difference)

11. (a) Due to the electron withdrawing effect of nitro group, the lone pair of e⁻ in – OH group is pulled in and H^+ ion is easily formed in phenol. Contrary to this methoxy group is electron releasing which increases –ve charge on – OH group and H^+ ion is not formed easily.   1

(b) Because it is hygroscopic in nature or is viscous in nature (or any other suitable property such as solubility in water , sweetness etc.)   1

12. **Teflon** : $CF_2 = CF_2$ ½
It is used as lubricant , Insulator etc.

Buna N : $CH_2 = CH – CH = CH_2$ and $CH_2 = CH- CN$ ½
It is used in making oil seals, hoses, tank lining.

OR

The polymers which can be produced by biological system such as micro organisms, plants or animals. They can also be chemically synthesized. These are biodegradable and are from renewable sources. They act as stabalizers, thickness, binders, lubricants, etc.   1

e.g PHBV and Nylon-2 – Nylon -6   ½, ½

13. Particle as well as wave nature of electron   1

$$\Delta E = E_2 - E_1 = \frac{(-13.6)}{4} - \frac{(-13.6)}{1} = 13.6 \times \frac{3}{4} eV$$

$$= 13.6 \times \frac{3}{4} \times 1.6 \times 10^{-19} J = 1.632 \times 10^{-8} J$$ 1

$$E = \frac{hc}{\lambda}$$

$$\lambda = \frac{hc}{E}$$ 1

(Since values of h and c are not provided in the question, final numerical value of λ is not expected from the students.

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14. Let the length of edge of unit cell be $= a$

Volume of unit cell $= a^3$

Molar mass of $NaCl = 58.5$ g mol^{-1} ; $Z = 4$

Mass of unit cell $= \dfrac{Z \times \text{Molar Mass}}{N_A}$

$$= \dfrac{4 \times 58.5 \text{ g mol}^{-1}}{0.022 \times 10^{23} \text{ mol}^{-1}} = 3.886 \times 10^{-22} \text{ g} \qquad 1$$

Density $= 2.165$ g cm^{-3}, Density of unit cell $= \dfrac{\text{Mass of unit Cell}}{\text{Volume}}$ ½

$$\therefore \ 2.165 \text{ g cm}^{-3} = \dfrac{3.886 \times 10^{-22} \text{ g}}{a^3} \quad \text{or} \quad a^3 = \dfrac{3.836 \times 10^{-22} \text{ cm}^3}{2.165} = 1.795 \times 10^{-22} \text{ cm}^3 \qquad 1$$

Edge length, $a = (1.795 \times 10^{-22} \text{ cm}^3)^{1/3} = 5.64 \times 10^{-8} = 564$ pm   ½

Edge length of Na$^+$ and Cl$^-$ $= a/2 = 564$ pm $/2 = 282$ pm

15. (a) $\dfrac{P^\circ_A - P_A}{P^\circ_A} = \dfrac{\text{Moles of Solvent}}{\text{Moles solute + Moles of Solvent}}$ 1

$P^\circ_A = 55.3$ mm of Hg, $P_A = ?$

Mass of Solvent $= (100 - 10)$ g $= 90$ g, No. of Moles of solvent $= \dfrac{90 \text{ g}}{18 \text{ g mol}^{-1}} = 5$ mol   1

No. of Moles of solute $= \dfrac{10}{60} = \dfrac{1}{6}$ mol

$\dfrac{55.3 - P_A}{55.3} = \dfrac{1/6}{1/6 + 5} = \dfrac{1}{31}$

$P_A = 53.52$ mm Hg

(b) Sodium chloride dissolves in water to form two ions whereas glucose is non–electrolyte and remains in molecular form only.   1

16. There are reactions for which the value of ΔG is not negative i.e they are non-spontaneous. However such reactions can be made spontaneous if they are coupled with reactions having very large negative Gibb's energy change of reaction.   1

When ΔG is +ve , then it is coupled with some other reaction which has ΔG –ve and large.

e.g $2Fe_2 O_3$ (s) $\rightarrow$ $4Fe$ (s) $+ 3O_2$ (g) $\Delta G^O = X$ kJmol^{-1} 1

Thus for the overall reaction to become spontaneous, this reaction is coupled with carbon monoxide oxidation reaction.

$6CO\ (g) + 3O_2\ (g)\ \rightarrow 6CO_2\quad \Delta G^O = \text{-Y kJmol}^{-1}$

Where $Y > X$. The large negative value of ΔG^O for this reaction shows that Fe_2O_3 can be reduced to Fe by CO. 1

(Or any other example from Biochemistry)

17. $$\log\frac{k_2}{k_1} = \frac{Ea}{2.303\,R}\left(\frac{T_2 - T_1}{T_1 T_2}\right)$$ 1

$$\log\frac{k_2}{k_1} = \frac{Ea}{2.303\times8.314\ \text{JK}^{-1}\text{mol}^{-1}}\left(\frac{350 - 300}{350\times300\text{K}}\right)$$

$$\log\frac{0.693/5}{0.693/20} = \frac{Ea}{2.303\times8.314}\times\frac{50}{350\times300}$$ 1

$$\log 4 = \frac{Ea}{2.303\times8.314}\times\frac{50}{350\times300}\text{J mol}^{-1}$$

$Ea = 2.303\times8.314\times300\times7\times0.6021\,\text{J mol}^{-1}$

$= 24210\,\text{J mol}^{-1} = 24.210\,\text{kJ mol}^{-1}$ 1

18. (a) Adsorption takes place in Silica gel. In anhydrous $CaCl_2$ the water vapours are uniformly distributed throughout the body of this solid, whereas in Silica gel, it is retained only on the surface. 1

(b) It forms an intermediate complex due to its electron deficient nature or because it is a lewis acid. 1

(c) Zeolites are good shape selective catalysts. 1

(or any other suitable example)

OR

(a) (i) Substances which behave as normal, strong electrolytes at low concentrations, but exhibit colloidal properties at higher concentrations due to formation of aggregate particles are known as micelles. 1

or

	Micelles	**Ordinary Colloids**
1.	Behave as normal electrolytes at low concentrations and as colloids at high concentration	Concentration does not affect the nature.
2.	They have lyophobic and lyophilic parts in aggregation.	No such polarity is present

Examples of micelles are : concentrated solution of soap and synthetic detergents. ½+½

(b) It states that greater the valency of the active ions, the greater is its precipitating power e.g in the precipitation of –ve sol, Al^{3+} ions are more effective than Ba^{2+} or Na^+ ion   1

19.   (a) a) $[Rn]\ 5f^{14}7s^2$ 1

       (b) The steady decrease in atomic size of lanthanoids with increase in atomic number due to filling of electrons in inner orbitals.   1

            Due to lanthanoid contraction the properties of 4d & 5d series elements become nearly same.   1

20.   (a) Ni (28) $\rightarrow$ $[Ar]3d^84s^2$

            In $[Ni\ (CO)_4\ ]$, Ni is in zero oxidation state

            Shape – Tetrahedral   Magnetic behaviour - Diamagnetic   2

       (b) cis- platin or any other example   1

21.   (a) It states that when a radioactive element emits an alpha particle, the new element gets displacement by two places left in the periodic table and when it emits beta particle then new element gets displaced one place to the right in the periodic table.   1

                  No. of α particle $= 8$ ½

                  No. of β particles $= 6$ ½

       (b) The process in which nucleus captures one electrons from K shell and the vacancy created in K- shell is filled by electron from higher energy level giving rise to characteristic X- rays is called K-capture.   1

22. (a) (i) $C_6H_5 - CO - CH_3 \xrightarrow{C_2H_5MgBr} C_6H_5 - \overset{\overset{\displaystyle OMgBr}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}} - C_2H_5 \xrightarrow{H_2O/H+}$

$$C_6H_5 - \overset{\overset{\displaystyle OH}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}} - CH_2 - CH_3 \qquad 1$$

(ii) $CH_3 - CH = CH_2 \xrightarrow{HBr} CH_3 - \underset{\underset{\displaystyle Br}{|}}{CH} - CH_3 \xrightarrow{aqKOH}$

$$CH_3 - \underset{\underset{\displaystyle OH}{|}}{CH} - CH_3 \xrightarrow{oxidation} CH_3 - CO - CH_3 \qquad 1$$
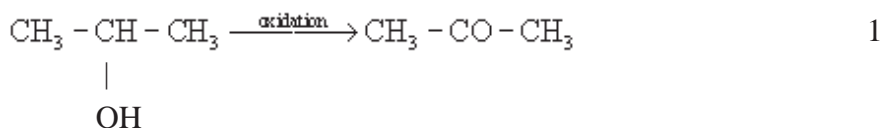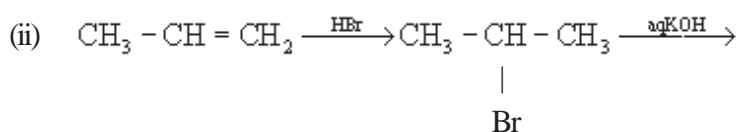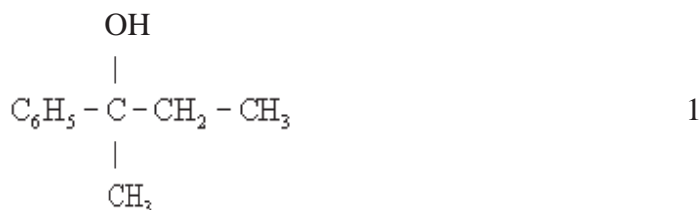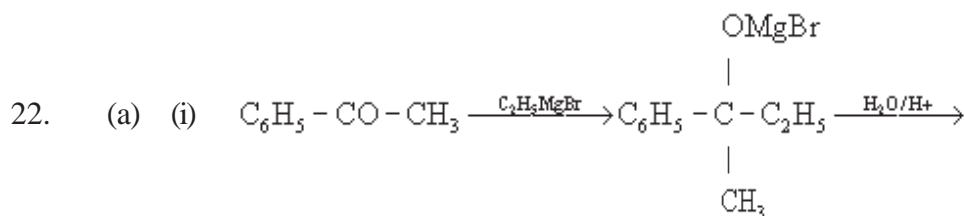
(a) Warm both the esters with NaOH and then heat both of them with I_2 and NaOH at 330 K. Ethyl acetate gives yellow ppt. of Iodoform. 1

23. (a) (i) **Sandmeyer's Reaction** :

$C_6H_5N_2^+Cl^- \xrightarrow{CuCl/HCl} C_6H_5Cl + N_2$ 1

(ii) **Coupling Reaction** :
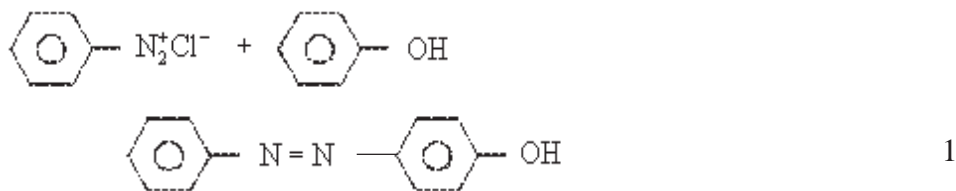
p – Hydroxy Azo Benzene 1

(b) Due to combined effect of steric hinderance, hydration & inductive effects
(award ½ mark if only one effect is mentioned) 1

24. **Antipyretics** : The chemical substances which are used to lower the temperature
of the body in high fever are called antipyretics. ½, ½
e.g Aspirin , Paracetamol etc. (any one)

Vat dyes : These are insoluble coloured components which are reduced to a
colourless soluble form and applied to the fabric and then oxidized to insoluble
coloured dye by exposure to air or oxidizing agent e.g Indigo. ½, ½

<u>Antibiotics</u> : The chemical substances which are produced by micro organisms and can inhibit the growth or even destroy other micro organisms   ½, ½

e.g : Penicillin, Tetracyclin (any one)

25. (a) (i)   The fuel cells convert energy of fuel directly into electricity.

(ii)   Products formed do not cause pollution.   2

(b) $I = 0.5$ amp, $t = 2h$, $Q = I \times t = 0.5 \, A \times 2 \times 60 \times 60 \, C = 3600 \, C$ 1

$Ag^+ + Ie \rightarrow Ag$

96,500 C deposit silver = 107.92 g

$$3600 \, C \text{ deposit silver} = \frac{107.92}{96,500} \times 3600 = 4.026 \, g$$

$$\text{Volume of silver deposited} = \frac{Mass}{Density} = \frac{4.026 \, g}{10.47 \, gcm^{-3}} = 0.345 \, cm^3 \qquad 1$$

$$\text{Thickness of Silver deposited} = \frac{0.3845 \, cm^3}{900 \, cm^2} = 0.0004272 \, cm \qquad 1$$

$$= 4.272 \times 10^{-4} \, cm \qquad 1$$

OR

(a) (i)   Because conductivity of saline water is more than ordinary water.   1

(ii)   Al is highly reactive and cannot be reduced easily . As compared to aluminium ion, water is reduced easily.   1

(b) Cell constant = Conductivity × Resistance.

$1.29 \, Sm^{-1} \times 100 \, ohm = 129 \, S \, m^{-1}\Omega = 1.29 \, S \, cm^{-1}\Omega$ 1

$$\text{Conductivity} = \frac{\text{Cell constant}}{\text{Resistance}} = \frac{1.29 \, S \, cm^{-1}\Omega}{520\Omega} = 0.248 \times 10^{-2} \, S \, cm^{-1} \qquad 1$$

$$\lambda m = \frac{K \times 1000 \, S \, cm^{-1}}{Molarity} = \frac{0.248 \times 10^{-2} \, S \, cm^{-1} \times 1000 \, cm^3}{0.02 \, mol}$$

$\lambda m = 124 \, S \, cm^2 \, mol^{-1}$ 1

26. (a) It is due to the small size of Fluorine (steric repulsion will be less in SiF_6^{-2}) Silicon cannot hold Chlorine atoms because of its larger size.   1

(b) In vapour state sulphur partly exists as S_2 molecule and S_2 molecule like O_2 has two unpaired electrons and hence exhibits paramagnetism.   1

(c) Because Pb^{2+} is more stable than Pb^{4+} due to inert pair effect whereas Sn^{4+} is more stable than Sn^{2+} 1

(d) Due to the presence of only one ionizable – OH group in H_3PO_2
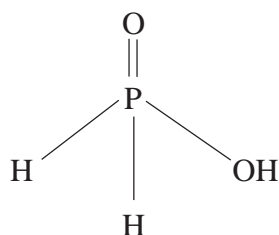
1

(e) F_2 is expected to have more bond dissociation energy due to its small bond length as compared to Cl_2. But actually the dissociation energy of F_2 is less because of greater repulsion in the non bonded electron pairs in F_2 molecule than in Cl_2.

1

OR

(a) (i) Because of stronger hydrogen bonds in H_2O, water has high stability as compared to hydrogen sulphide.

1

(ii) Because $AlCl_3$ is a strong lewis acid / or is an electron deficient compound.

1

(iii) Because white phosphorus is a discrete P_4 molecule whereas red phosphorous is polymeric.

1

(b) Phosphorous Acid $XeOF_4$
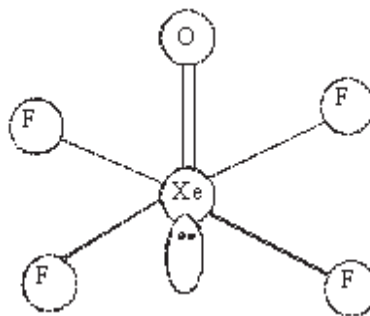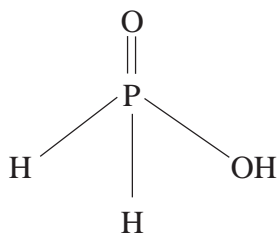
1, 1

27. (a) The amino acids that can be made by our body and therefore, we do not require them in our diet are called non- essential amino acids

1

The amino acids which are not synthesized in our body and are to be supplied to our diet are called essential amino acids.

1

(b) Basic equation : $6CO_2 + 6H_2O \xrightarrow[Chlorophyll]{h\upsilon} C_6H_{12}O_6 + 6O_2$

2

(for description of photosynthesis in it types/ stages/ sequences/ steps award 1 mark.

(c) Pyruvate and ATP molecules.

1

OR

(a) (i) Co- enzymes : The non proteinous components which increase the activity of enzymes are called co- enzymes.   1

(ii) Mutation in biomolecules : It is a chemical change in DNA molecule that could lead to synthesis of proteins with altered amino acid sequence e.g sickel cell anaemia is caused by mutation.   1

(iii) Nucleotide : is a species which contains a phosphate unit, a sugar unit, and any one of the pyrimdine nitrogen bases or purines. e.g Ribonucleotide, deoxy -ribonucleotides.   1

(b) (i) They support plant structure, e.g cellulose.

(ii) They produce energy necessary for functioning of living body and doing work.

(iii) They are used to store chemical energy in the form of glycogen in liver. Starch is main storage polysaccharide of plants.

(iv) Cellulose present in grass and plants acts as a food for various grazing animals.

(any one function)   2

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BIOLOGY (Theory)

Time allowed : 3 hours   *Maximum Marks : 70*

General Instructions :

*(i) This question paper consists of **four** sections **A, B, C** and **D**. Section A contains **5** questions of **1** mark each, Section **B** is of **10** questions of **2** marks each, Section **C** is of **10** questions of **3** marks each and Section **D** is of **3** questions of **5** marks each.*

*(ii) **All** questions are compulsory.*

(iii) There is no overall choice. However, an internal choice has been provided in one question of 2 marks, one question of 3 marks and all three questions of 5 marks weightage. Attempt only one of the choices in such questions.

*(iv) Questions number 1 to 5 are to be answered in **one word** or **one sentence** each.*

(v) Questions number 6 to 15 are to be answered in approximately 20-30 words each.

(vi) Questions number 16 to 25 are to be answered in approximately 30-50 words each.

(vii) Questions number 26 to 28 are to be answered in approximately 80-120 words each.

QUESTION PAPER CODE 57/1/1

SECTION A

1. What prevents collapsing of our trachea during breathing ?   1

2. What advantage does the sea anemone get in the sea anemone-hermit crab facultative mutualism ? Give an alternative term for this kind of mutualism.   1

3. Name the nitrogenous waste excreted in the larval and adult stages of frog respectively.   1

4. In a wheat field, some broad-leaved weeds were found by a farmer. Which phytohormone can be used to eradicate them ?   1

5. Correct the statement given below with respect to brazzein "Brazzein is a high calorie carbohydrate."   1

SECTION B

6. What is reverse osmosis ? Give its one application.   2

7. Which two heart sounds are. heard through the stethoscope when placed on the chest ? When are these sounds produced respectively ? 2

8. How is polyspermy prevented in humans ? 2

9. Write the full form of ELISA ? Give an example of the clinical application of ELISA test. 2

10. What is fermentation ? Name any two organic compounds produced in this process. 2

<div align="center">Or</div>

What is glycolysis ? Name the two monosaccharides which readily enter the glycolytic pathway. 2

11. Draw a diagrammatic sketch of the microscopic view of a mammalian sperm and label any four parts in it. 2

12. Name the location and function of Meibomian glands in the human eye. 2

13. What would happen to the successive trophic levels in the pyramid of energy if the rate of reproduction of phytoplankton was slowed down ? Suggest two factors, which could cause such a reduction in phytoplankton reproduction. 2

14. What is cryopreservation ? Give its one use. 2

15. What is meant by total fertility rate ? How does it differ from replacement level ? 2

<div align="center">SECTION C</div>

16. What is agamospermy ? How is agamospermy different from parthenogenesis and parthenocarpy ? 3

17. (i) How can haploid plants be raised in the laboratory ?

(ii) Name the plant first used in India to produce haploid plants,

(iii) Can haploid plants raise their own progeny ? Give reason. 3

18. What is the law of limiting factors ? How would the rate of photosynthesis be affected if the soil water becomes limiting ? Explain. 3

19. Give information as asked about the following mineral nutrients in plants : 3

(a) *Iron:* (i) it is a constituent of —, (ii) its one typical deficiency symptom.

(b) *Zinc:* (i) the group of enzymes it activates, (ii) it is needed for the synthesis of —.

(c) *Phosphorus:* (i) the form in which it is absorbed from the soil, (ii) its deficiency effect on seed germination.

20. What is the role of calcium ions, troponin and F-Actin during contraction in striated muscles of humans ?   3

<div align="center">**Or**</div>

Explain giving one example of each, the three types of joints in human skeleton, based on the capacity of movement.   3

21. A patient was complaining of frequent urination, excessive thirst, hunger, and tiredness. His fasting blood glucose level was found higher than 130 mg/dL on two occasions.   3
   (i)   Name the disease,
   (ii)   Give the root cause of this disease,
   (iii) Explain why the blood glucose level is. higher than 130 mg/dL.

22. Name and explain any three adaptations of mangroves to the conditions prevailing in the Sunderbans (West Bengal).   3

23. What is eutrophication ? Explain its consequences on the life of plants and animals living in such waters. Why is oxygen depletion in a eutrophicated water-body faster at night than during the day ?   3

24. (i)   What is a vaccine. Give an example of a vaccine produced by recombinant DNA technology ?
   (ii)   Name the diseases against which DTP vaccination develops immunity.   3

25. Define senescence. Explain the 'programmed senescence theory' of ageing.   3

<div align="center">**SECTION D**</div>

26. Explain the process of Crassulacean acid metabolism. How is it advantageous to plants ?   5

<div align="center">**Or**</div>

Explain the major steps in Krebs cycle. Why is this cycle also called citric acid cycle ?   5

27. What is sustainable agriculture ? Explain the contribution of biopesticides and biofertilisers in sustainable agriculture.   5

<div align="center">**Or**</div>

What is electrocardiography ? What is meant by P-Q interval and S-T interval in electrocardiography ? Mention two medical applications of this technique.   5

28. (i) Draw a section of the microscopic structure of human retina and label any six parts in it.

(ii) Name the structure that determines the eye colour in humans. What is the normal function of this structure ?

(iii) Name the point of sharpest vision and the point of no vision in human eye. 5

Or

(i) Draw the basic structure of a neural synapse and label the following parts in it :

Presynaptic cell, Postsynaptic cell, Vesicles, Neurotransmitter, Receptor, Synaptic cleft.

(ii) Give any two differences between chemical synapses and electrical synapses. 5

QUESTION PAPER CODE 57/1

SECTION A

1. What is haemocoel ? 1

2. What do you call the study of the timing of seasonal activities of plants in relation to change in environmental conditions ? 1

3. What happens to the glycogen concentration in the liver cells when the concentration of adrenaline in the blood stream increases ? 1

4. Where does fertilisation normally take place in a human female ? 1

5. A 30-year old man with a history of no prior immunization steps on a nail while walking barefoot in his courtyard and bleeds. Which immunizations should he undergo ? 1

SECTION B

6. Name the respective mineral nutrient element of plants that 2
(i) is needed in the synthesis of auxins,
(ii) is a constituent of ferredoxin.
(iii) forms the core constituent of the ring structure of chlorophyll.
(iv) forms the component of nitrogenase and nitrate reductase.

7. Explain how the hormones glucagon and insulin are antagonistic to each other in their action. 2

8. List any four ways how the use of auxins may help in obtaining better yield of fruit crops. 2

9. What is quarantine ? Why is quarantine essential before introducing a plant species from another country ? 2

10. Two groups (A and B) of bean plants of similar size and same leaf area were placed in identical conditions. Group A was exposed to light of wavelength of 400 - 450 nm, and Group B to light of wavelength of 500 - 550 nm. Compare the photosynthetic rate of the two groups giving reason. 2

11. Give two differences between rheumatoid arthritis and gouty arthritis. 2

OR

What is osteoporosis ? Name two factors responsible for this condition. 2

12. Explain the relationship between biotic potential and environmental resistance. 2

13. What is eutrophication ? Explain its consequences on the life of plants and animals in such water bodies. 2

14. Why are stimulants and hallucinogens categorised as psychotropic drugs ? Give one example each of the two types mentioned. 2

15. Draw a labelled diagram of a part of the transverse section through seminiferous tubule of human testis showing the various stages of spermatogenesis. 2

SECTION C

16. A section of root nodule of chick-pea plant appears pink.
  (i) What is this colour due to ?
  (ii) What type of condition does this pigment create in the nodules ?
  (iii) Explain the process of biological nitrogen fixation in the root nodules. 3

17. How does oxidative phosphorylation differ from photophosphorylation ? Explain. 3

18. Describe the location of Juxtaglomerular apparatus in human kidney. Explain its function. 3

19. Name the type of pollination taking place in coconut palms. List five characteristics of the flowers of coconut plant favouring this type of pollination. 3

20. List any three major categories of cancer. Explain briefly each category giving one example. 3

21. A 5-year-old child has complained of pain and swollen joints in his legs for the past one year. On physical examination, the doctor found bleeding gums, anaemia and emaciation.
  (i) Name the deficient vitamin and the corresponding deficiency disease the child is suffering from.
  (ii) List any four functions of this vitamin. 3

OR

Why do pregnant women need to have higher levels of folic acid, iron and calcium in their diet ? 3

22. A person has been diagnosed to be HIV positive.

(i) Name the test which the person underwent.

(ii) Write the full name of the pathogen involved and describe its structure,

(iii) Which particular cells of this person are likely to get destroyed ? 3

23. (i) What are tropical rain forests ?

(ii) Name any two dominant plant species of such forests in India.

(iii) Why is soil in tropical deciduous forests richer in nutrients than in tropical rain forests ? 3

24. What is senescence ? How do free radicals make senescence faster ? 3

25. Describe the special adaptations of xerophytes with respect to root system, stem and leaves. 3

SECTION D

26. (i) Name the phenomenon by which the water rises in the xylem vessels in small sized plants,

(ii) Explain the cohesion theory of ascent of water in tall trees. 5

OR

(i) Explain the mechanism of photorespiration.

(ii) Name the cell organelles involved in the process. 5

27. What is somatic hybridisation ? Explain the steps involved in the production of a somatic hybrid. 5

OR

(i) What are biopesticides ? Give any two examples of their application.

(ii) What is mycorrhiza ? How does it act as a-biofertilizer ? 5

28. List and explain the three ways in which carbon dioxide is transported by blood in the human body. Support the answer with a suitable diagram. 5

OR

(i) Describe step by step what happens in the different phases of cardiac cycle in humans.

(ii) Name the two heart sounds and mention when they are respectively produced in the cardiac cycle. 5

Marking Scheme ---- Biology (Theory)

General Instructions

The Marking Scheme and mechanics of marking

1   In the marking scheme the marking points are separated by commas, one oblique line (/) indicates acceptable alternative, two obliques (//) indicate complete acceptable alternative set of marking points.

2.   Any words/phrases given within brackets do not have marks.

3.   Allow spelling mistakes unless the misspelt word has another biological meaning. Ignore plurals unless otherwise stated in the marking scheme.

4.   In any question exclusively on diagram no marks on any description. But in questions on descriptions, same value points may be marked on the diagrams as a substitute.

5.   All awarded marks are to be written in the left hand margin at the end of the question or its part.

6.   Place a tick ( ) in red directly on the key/operative term or idea provided it is in correct context. Place "Half-tick" ½ wherever there is ½ mark in the marking scheme. (Do not place tick indiscriminately just to show that you have read the answer).

7.   If no marks are awarded to any part or question put a cross (x) at incorrect value portion and mark it zero (in words only).

8.   Add up ticks or the half ticks for a part of the question, do the calculation if any, and write the part total or the question total in the left hand margin.

9.   Add part totals of the question and write the question total at the end. Count all the ticks for the entire question as a recheck and draw a circle around the question total to confirm correct addition.

10.   If parts have been attempted at different places do the totalling at the end of the part attempted last.

11.   If any extra part is attempted or any question is reattempted, score out the last one and write "extra".

12.   In questions where only a certain number of items are asked evaluate only that many numbers in sequence as is asked ignoring all the extra ones even if otherwise correct.

13.   Transcribe the marks on the cover page. Add up question totals. Recheck the script total by adding up circled marks in the script.

14.   Points/answer given in brackets in marking scheme are not so important and may be ignored for marking.

EXPECTED ANSWERS/VALUE POINTS

SECTION A

Q.Nos. 1 - 5 are to be answered in one word or one sentence each

1. (Incomplete / C - shaped) rings of cartilage

[1 mark]

2. Transport / to reach new food sources , proto cooperation = ½ + ½

[1 mark]

3. Tadpole = ammonia , ½

   Frog = urea = ½

[1 mark]

4. 2, 4 - D / 2, 4 - Dicholorophenoxy acetic acid / (synthetic) auxin

[1 mark]

5. Brazzein is a <u>low</u> calorie <u>protein</u> = ½ + ½

[1 mark]

SECTION B

Q.Nos. 6 - 15 are to be answered in approximately 20 - 30 words each

6. Reverse osmosis : When an additional pressure is applied during the process of osmosis (more than the osmotic pressure applied to prevent the flow of water into the solution) , then water can be made to flow out of the solution into the water (in the beaker) = 1

   Application of reverse osmosis : Used for removing salts from saline water = 1

[1 + 1 = 2 marks]

7. lubb / lub , dubb / dub = ½ + ½ = 1

   The first sound (lubb) created by closure of atrioventricular / AV valves = ½

   Second sound (dubb) created by closure of semilunar valves = ½

[1 + ½ + ½ = 2 marks]

8. The egg shows cortical reaction, and zona reaction , egg membrane becomes impervious to any other sperm = ½ + ½ + 1

[2 marks]

9. ELISA - Enzyme linked immunosorbent assay = 1

   Application - Detection of HIV infection = 1

[1 + 1 = 2 marks]

10. The process of anaerobic respiration (of organic compound) by living cells specially microorganisms = 1

Ethanol / lactic acid / ATP (any two) = ½ + ½

[1 + ½ + ½ = 2 marks]

OR

The (anaerobic) pathway of metabolism converting glucose to pyruvate in the presence of enzymes (resulting in net gain of two ATP and two NADH molecules) = 1

Glucose , fructose = ½ + ½

[1 + ½ + ½ = 2 marks]

11. Diagrammatic sketch of the microscopic view of a mammalian sperm and labelling of any four parts in it.
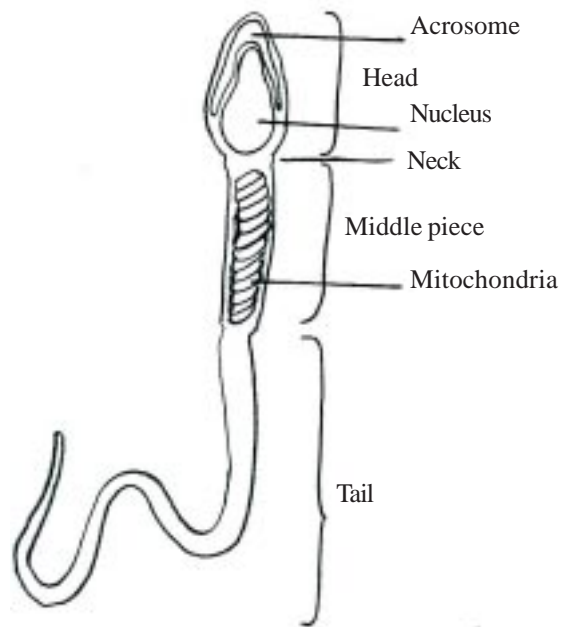
Any four labels = ½ × 4 = 2   [2 marks]

12. Location : Embedded in (tarsal plate) eyelids = 1

Function : Oily secretion helps to keep the eyelids from adhering to each other = 1

[1 + 1 = 2 marks]

13. Gradual decrease of energy at successive trophic levels = 1

Decrease in light / nutrients / oxygen (any two) = ½ + ½

[1 + ½ + ½ = 2 marks]

14. Process of storing biological material at ultra low temperature either by very rapid cooling (used for storing seeds) or by gradual cooling and simultaneous dehydration at low temperature (used for tissue culture) = 1

Significance : Material can be stored for long period of time in compact low maintenance refrigeration units = 1

[1 +1 = 2 marks]

15. TFR (Total Fertility Rate) : Average number of children that would be born to a woman during her life time = 1

Whereas replacement level (RL) is the number of children a couple must produce to replace themselves in a population = 1

[1 + 1 = 2 marks]

SECTION C

Q.Nos. 16 - 25 are to be answered in approximately 30 - 50 words each

16. Agamospermy : Seeds are formed from nucellus / without fusion of gametes = 1

Parthenogenesis : Seeds / embryo develop from unfertilized female gametes = 1

Parthenocarpy : Development of fruit in an unfertilized flower / no viable seeds are formed = 1

(any two correct answers = 2 marks)

[1 + 1 + 1 = 3 marks]

17. (i) Haploid plants are raised by culturing their anthers / unfertilized ovaries / unfertilized ovules = 1

(ii) Datura = 1

(iii) No = ½, they are sterile plants = ½ //

(1 mark to be awarded only if reason provided) = 1

[1 + 1 + 1 = 3 marks]

18. Law of limiting factors : At a given time only the factor that is most limiting among all will determine the rate of photosynthesis. = 1

(i) Stomatal closure, the resultant decrease in CO_2 supply = ½ + ½

(ii) Reduced leaf water potential, reduces leaf surface area. = ½ + ½

[1 + 1 + 1 = 3 marks]

19. (a) Iron : Constituent of ferredoxin / cytochromes / enzymes in electron transport chain = ½

Deficiency symptom : chlorosis (of leaves) = ½

(b) Zinc : Carboxylases , synthesis of auxins $= \frac{1}{2} + \frac{1}{2}$

(c) Phosphorus : Phosphate ions / $H_2PO_4^-$ / HPO_4^{2-} $= \frac{1}{2}$

   Deficiency effect : Delayed seed germination $= \frac{1}{2}$

$$[1 + 1 + 1 = 3 \text{ marks}]$$

20. Calcium ions : Bind to specific sites on troponin (component of thin / actin filaments), Changes the (three dimensional) shape of troponin molecule and exposes active sites

F - actin $= \frac{1}{2} + \frac{1}{2}$

Troponin : Masks the active sites on F - actin $= 1$

F - actin : Has active sites that bind to myosin head $= 1$

$$[1 + 1 + 1 = 3 \text{ marks}]$$

OR

Fixed / immovable / fibrous , Examples : Skull bones / roots of teeth with sockets of maxillae / mandible / jaw $= \frac{1}{2} + \frac{1}{2}$

Slightly movable / cartilaginous , Example : Joints between adjacent vertebrae $= \frac{1}{2} + \frac{1}{2}$

Movable / synovial , Examples : Ball and socket joints (hip joint / shoulder joint) / hinge joints (knee / elbow joint) / pivot joints / gliding joints / ellipsoidal joints $= \frac{1}{2} + \frac{1}{2}$

($\frac{1}{2}$ mark for example , $\frac{1}{2}$ for name / explanation)

$$[1 + 1 + 1 = 3 \text{ marks}]$$

21. (i) Diabetes mellitus $= 1$

   (ii) Less insulin $= 1$

   (iii) Carbohydrates / sugars not metabolised / glucose not converted to glycogen (in liver) $= 1$

$$[1 + 1 + 1 = 3 \text{ marks}]$$

22. Pneumatophores , Special roots which are negatively geotropic and come out of the soil / carry out exchange of oxygen and carbon dioxide needed by root $= \frac{1}{2} + \frac{1}{2}$

Prop and stilt roots , roots grow downwards from the trunk and branches / to give support to the plants in wet substratum $= \frac{1}{2} + \frac{1}{2}$

Vivipary , seeds germinate inside the fruit while still attached to the plants / it permits the plants to escape the effect of salinity on seed germination $= \frac{1}{2} + \frac{1}{2}$

$$[1 + 1 + 1 = 3 \text{ marks}]$$

23. **Eutrophication :** Process of nutrient enrichment of water , and consequent loss of species diversity $= \frac{1}{2} + \frac{1}{2}$

Consequences :

Excess nutrients cause profuse growth of algae (algal bloom) / blue green algae causing oxygen deficiency in water $= \frac{1}{2}$

Aquatic animals (e.g. fish) may die due to toxicity / lack of oxygen $= \frac{1}{2}$

Because photosynthesis which oxygenates the water ceases at night $= 1$

$[1 + 1 + 1 = 3 \text{ marks}]$

24. (i) Vaccine : Inactivated / weakened / pathogens injected into the body which produce special antibodies / generate immune response. $= 1$,

Example : Hepatits B $= \frac{1}{2}$

(ii) DTP Vaccination : Diphtheria , tetanus , pertussis $= \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$

$[1\frac{1}{2} + 1\frac{1}{2} = 3 \text{ marks}]$

25. Senescence : Impairment of physiological functions that occurs due to advancing age $= 1$

Programmed senescence theory :

B or T lymphocytes $= \frac{1}{2}$, (having the receptors for self antigens)

undergo programmed cell death / apoptosis $= \frac{1}{2}$,

process eliminates about 90% of B cells made in the bone marrow $= \frac{1}{2}$,

a parallel mechanism occurs with T cells in the thymus $= \frac{1}{2}$ ($\frac{1}{2} \times 4 = 2$)

$[1 + 2 = 3 \text{ marks}]$

SECTION D

Q.Nos. 16 - 25 are to be answered in approximately 80 - 120 words each

26. Crassulacean acid metabolism : Stomata remain open during night and close during day to conserve water , CO_2 is taken up during night and fixed into malic acid that is stored in the vacuoles , during day malic acid is used as a source of CO_2, malic acid is decarboxylated $= \frac{1}{2} \times 4 = 2$

CO_2 is fixed by Calvin Cycle / RuBP accepts CO_2 to form PGA , six turns of Calvin cycle results in formation of one molecule of glucose $= 1 + 1$

Advantage : It is an adaptation for CAM plants to carry out photosynthesis without much loss of water , as stomata remain closed during daytime when temperature is high $= \frac{1}{2} + \frac{1}{2}$

$[2 + 2 + 1 = 5 \text{ marks}]$

OR

Major steps in Krebs cycle:
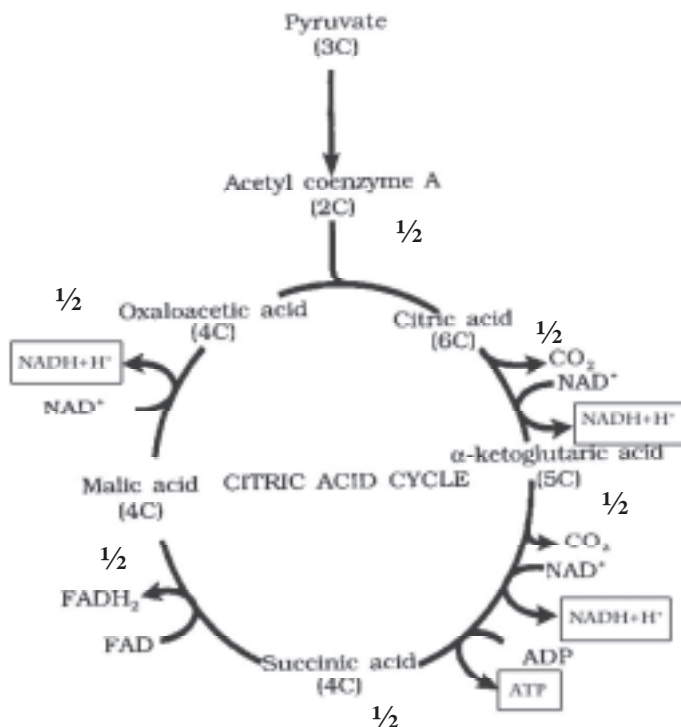
(key steps ½ × 6 = 3)

$CO_2 = ½$ (any one place)

$NAD^+ \rightarrow NADH + H^+ = ½$ (any one place)

$ADP \rightarrow ATP // FAD \rightarrow FADH_2 = ½$.

(The same sequence can be put in the explanatory form)

First formed (stable) compound is citric acid $= ½$

[3 + 1½ + ½ = 5 marks]

27. Sustainble agriculture : Agricultural practices using renewable resources , causing minimum pollution , resulting an optimum yield $= 1 \times 3$

Bio-pesticides : Biological agents that control weeds / insects / pathogens , without damaging environment $= ½ + ½$

Bio-fertilisers : Biological agents which enrich the soil $= ½$, thereby increase the yield $= ½$

[3 + 1 + 1 = 5 marks]

OR

Electrocardiography : Non invasive procedure for recording electrical changes in the heart / the record which is called an electrocardiogram (ECG or EKG) shows the series of waves that relate to the electrical impulses which occur during each beat of the heart which may be printed on paper or displayed on a monitor $= 1$

P-Q interval (P-R interval) : Time taken by the impulse to travel through atria , AV node and the rest of the conducting tissues = ½ + ½ ,

S-T interval : Time between the end of the spread of impulse through ventricles, and its repolarisation = ½ + ½

Medical Applications :

(i)   Starting point for detecting cardiac problems

(ii)   Used to evaluate causes of symptoms such as chest pain / shortness of breath / palpitations

(iii) Reveals rate of heart beat / diagnose heart disorders following a cardiac arrest (myocardial infarction) / deviations from normal pattern of heart beat / coronary artery diseases etc

(iv)   Used routinely in physical examinations / for monitoring patient's condition during and after surgery / intensive care = 1 + 1 = 2 (any two)

[1 + 2 + 2 = 5 marks]

28.   **Section of the microscopic structure of human retina and labelling of any six parts**

Microscopic structure of retina.
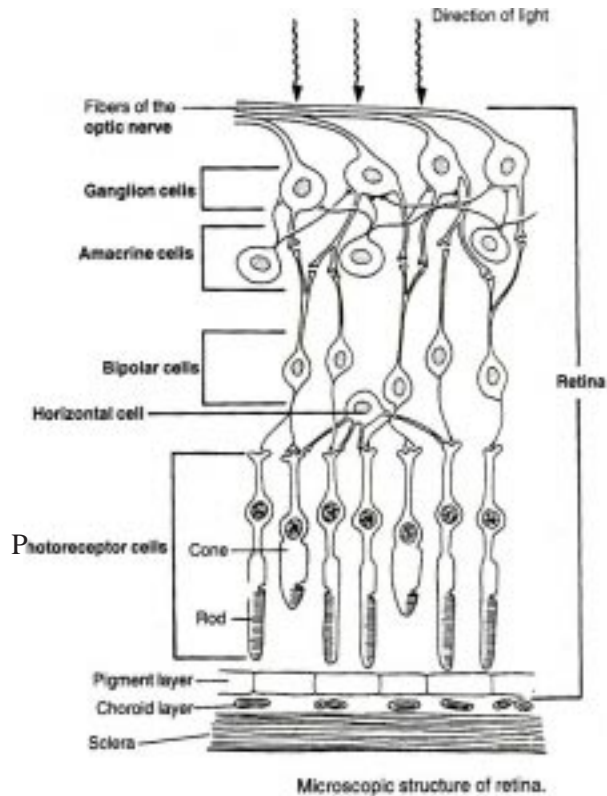
Label any six parts = ½ × 6 = 3

Eye colour : Iris = ½ , Function : regulates the amount of light entering the eye (by altering the size of pupil) = ½

Sharpest vision : fovea = ½ ,

No vision : blind spot = ½

[3 + 1 + 1 = 5 marks]

OR

Basic structure of a neural synapse and label the following parts in it :
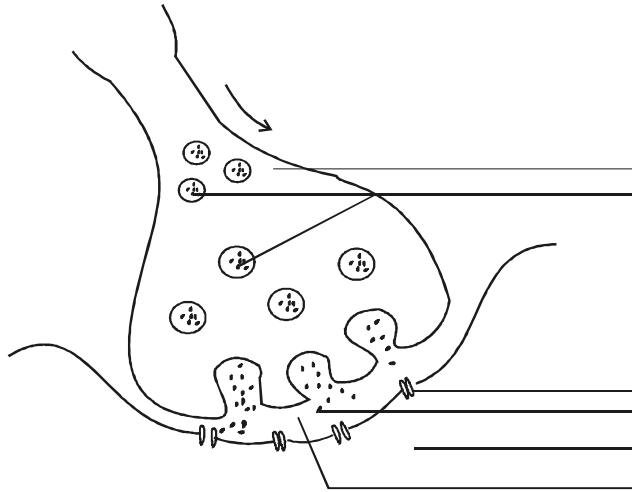
½×6 = 3

Two differences between chemical synapses and electrical synapses.

	CHEMICAL SYNAPSES		ELECTRICAL SYNAPSES
(i)	Transmission of impulse from pre- to postsynaptic site occurs due to the liberation of chemical mediator	(i)	Action potential arriving at the presynaptic side of cleft, can adquately depolarise the postsynaptic membrane to directly trigger its action potential
(ii)	Presynaptic and postsynaptic neurons are separated by a space, the synpatic cleft, about 20 nm wide.	(ii)	Presynaptic and postsynaptic neurons are separated by a space, the synaptic cleft, of only 0.2 nm
(iii)	Synaptic delay present	(iii)	Synaptic delay absent.

(Any two = 1 + 1 = 2)

[3 + 2 = 5 marks]

QUESTION PAPER CODE 57/1

EXPECTED ANSWERS/VALUE POINTS

SECTION A

Question number 1 to 5 are to be answered in one word or one sentence each

1. Haemocoel : body cavity of arthropod / insect / some mollusc , filled with body
    fluid / blood = ½ + ½   [1 mark]

2. Phenology = 1   [1 mark]

3.   It decreases = 1

<div align="right">[1 mark]</div>

4.   Fallopian tubes / (ampulla of) oviduct = 1

<div align="right">[1 mark]</div>

5.   Tetanus / ATS / Tetanus toxoid / TT / (Anti) <u>Tetanus</u> = 1

<div align="right">[1 mark]</div>

SECTION B

Question number 6 to 15 are to be answered in approximately 20 - 30 words each

6.   (i)   Zinc = ½ ,
       (ii)   Iron = ½ ,
       (iii) Magnesium = ½ ,
       (iv) Molybdenum = ½

<div align="right">[½ × 4 = 2 marks]</div>

7.   Glucagon increases blood glucose level by stimulating conversion of glycogen to glucose in liver cells = 1

       Insulin decreases blood glucose level by conversion of glucose to glycogen in liver and muscles = 1

<div align="right">[1 + 1 = 2 marks]</div>

8.   Controlling preharvest fruit drop , enhancing flowering = 1 + 1

       Note : (Consider only two uses instead of four)

<div align="right">[2 marks]</div>

9.   **Quarantine :** Careful examination of all introduction of plants for the presence of weeds insects and disease causing organisms = 1

       <u>Reduces risk of entry of plant</u> pathogens / insects / weeds in the country = 1

<div align="right">[2 marks]</div>

10.   Plant under violet / light of wavelength 400 - 450 nm will carry on photosynthesis at a greater rate = 1

       Green light / light of wavelength 500 - 550 nm is reflected back / not utilized = 1

<div align="right">[2 marks]</div>

11.   Two differences between rheumatoid arthritis and gouty arthritis.

	Rheumatoid Arthritis	**Gouty Arthritis**
(i)	Accumulation of abnormal granules /	Accumulation of uric acid in joints
(ii)	pannus on the surface of (cartilage) the joint	(as monosodium salt)

<div align="right">= 1 + 1</div>

       Note : (Consider only one difference instead of two)

<div align="right">[1 + 1 = 2 marks]</div>

(Most common) progressive degenerative bone disease , characterised by low bone mass / (micro architectural) deterioration of the bone / increased fragility / proneness to fracture $= ½ + ½$

Factors :

(i) Imbalances of hormones like parathyroid / thyrocalcitonin / sex hormones $= ½$

(ii) Deficiencies of calcium / Vitamin D $= ½$

$[1 + 1 = 2$ marks$]$

12. Biotic potential : Inherent / physiological capacity of an organism to reproduce / increase in number , is only realised when environmental conditions are non-limiting $= 1$

Environmental resistance : Nature keeps a check on the expression of Biotic potential / population size, all factors that keep a check on population size constitute environmental resistance $= 1$

$[1 + 1 = 2$ marks$]$

13. Eutrophication : Excessive enrichment of water bodies with nutrients (due to inflow of waste water) causes profuse growth of algae (algal bloom) , releases toxins in water causes oxygen deficiency in water $= ½ + ½$

Growth of algae inhibited due to toxins , aquatic animals (fish) may die due to toxicity or lack of oxygen / loss of species $= 1$

$[1 + 1 = 2$ marks$]$

14. Both alter the activity of nervous system $= 1$

Stimulant : Caffeine / amphetamine / cocaine / novacaine $= ½$

Hallucinogen : LSD / Mescaline / psilocybin / charas / hashish / bhang / marijuana $= ½$

$[1 + 1 = 2$ marks$]$

15. Labelled diagram of a part of the transverse section through seminiferous tubule of human testis showing the various stages of spermatogenesis.
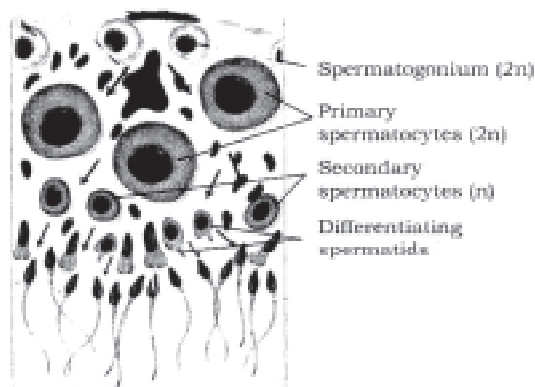
Label only stages $= ½ × 4$

$[2$ marks$]$

SECTION C

Question number 16 to 25 are to be answered in approximately 30 - 50 words each

16. (i) Leghaemoglobin $= ½$

    (ii) Anaerobic condition $= ½$

    (iii) Nodule acts as a site for nitrogen fixation , enzyme nitrogenase , catalyses the reduction of atmospheric N_2 to $NH_3 = ½ + ½ + ½$,

    it requires :

    (a) strong reducing agent (FAD) /

    (b) ATP to transfer hydrogen atoms to dinitrogen

    (any one mentioned) $= ½$

    $[½ + ½ + 2 = 3 \text{ marks}]$

17. Oxidative phosphorylation : The whole process by which oxygen effectively allows the production of ATP by (phosphorylation) attachment of P to ADP $= 1$

    Occurs in mitochondria $= ½$

    Photophosphorylation : Production of ATP from ADP in combination with electron transport system in an organism dependent on light / photosynthesis $= 1$

    Occurs in chloroplast $= ½$

    $[1½ + 1½ = 3 \text{ marks}]$

18. Location : Juxtaglomerular apparatus is located where the distal convoluted tubule passes close to the Bowman's capsule between the afferent and efferent arterioles $= 1$

    Function : JGA cells secrete enzymes like renin , that modulate blood pressure / renal blood flow and glomerular filteration rate are regulated $= 1 + 1$

    $[1 + 2 = 3 \text{ marks}]$

19. Anemophily / wind pollination $= ½$

    Unisexual flower , large quantity of pollen , pollen small / smooth / dry , devoid of scent / nectar , inconspicuous / not showy $= ½ \times 5$

    $[½ + 2½ = 3 \text{ marks}]$

20. (i) Carcinomas , derived from epithelial tissue / skin / epithelial lining of internal organs or glands

    (ii) Melanomas , cancerous growth of melanocytes (type of skin cell)

    (iii) Sarcomas , derived from tissue of mesodermal origin / bone or fat or cartilage

    (iv) Leukemias and lymphomas , tumors of haematopoietic cells
       (any three)
       ½ for name and ½ for explanation / example

    $[1 + 1 + 1 = 3 \text{ marks}]$

21. (i) Vitamin C = ½ , scurvy = ½

   (ii) Formation and maintenance of collagen , bone matrix , tooth dentine , metabolism of amino acids , helps body to withstand injury from burns , acts as antioxidant (any four) = ½ × 4 = 2

   [1 + 2 = 3 marks]

   OR

   Folic acid : Nucleoprotein synthesis / maturation of RBC = 1

   Iron : Helps both mother and baby's blood to carry oxygen / for synthesis of Hb = 1

   Calcium : During pregnancy can prevent the mother from losing her own bone calcium , as the foetus uses the mineral for bone growth = ½ + ½

   [1 + 1 + 1 = 3 marks]

22. (i) ELISA / Enzyme Linked Immunosorbent Assay = 1

   (ii) Human immunodeficiency virus (HIV) = ½ ,

   description / marked on diagram - protein coat / (single stranded) RNA = ½

   (iii) T - helper cells = 1

   [1 + 1 + 1 = 3 marks]

23. (i) Tropical rain forests : Evergreen , possessing highest standing crop / biomass (among all biomes) occuring in warm and high rainfall region , show 30 - 40 m tall canopy structure with 4 - 5 strata by different plant spieces , tree trunks at the base are usually buttressed , grasses on the ground almost absent (any two points) = ½ + ½

   (ii) Dominant plant species : Dipterocarpus , Artocarpus , Hopea (any two) = ½ + ½

   (iii) Less leaching in tropical deciduous forests = 1

   [1 + 1 + 1 = 3 marks]

24. Senescence : Impairment of physiological functions occuring due to advancing age = 1

   Free radical takes an electron from any other molecule which inturn becomes unstable and combines readily with other molecules = ½

   Chain reaction occurs resulting in a series of compounds some of which may be harmful = ½

   These compounds damage the proteins , membranes and DNA / nucleic acid (of nucleus as well as mitochondria) = ½

   The damage caused by free radicle (oxygen) is responsible for many bodily changes that come with ageing = ½

   [1 + 2 = 3 marks]

25. Root system : Well developed , profusely branched / extensively spread which can reach up to water table , capable of absorbing water from deep soil , very shallow roots which pick up the slightest dew and survive on that

Stems : Fleshy , green , succulent , spongy , phylloclade

Leaves : Small , sunken stomata , leathery surface , waxy cuticle that help in low transpiration , deciduous

(any two in each case) = ($\frac{1}{2}$ + $\frac{1}{2}$) $\times$ 3 = 3

[3 marks]

SECTION D

Question number 25 to 28 are to be answered in approximately 80 - 120 words each

26. (i) Capillarity / root pressure = 1

   (ii) Cohesion theory

      a) based on force of cohesion between water molecules ,

      b) adhesion of water molecules with the walls of vessels(of lignocellulose),

      c) allows formation of continuous water column throughout plant from the root tip to the top ,

      d) evaporation of water from the leaf to the atmosphere results in decrease of water potential of epidermal cells ,

      e) transpiration pull created ,

      f) water lost by transpirational pull , from these cells is replaced by water moving from the adjacent cells ,

      g) along a water potential gradient ,

      h) water lost from the leaf cells is in turn replaced by water moving from xylem elements in leaf veins

         = $\frac{1}{2}$ $\times$ 8

[1 + 4 = 5 marks]

OR

   (i) (a) In C_3 plants RuBP carboxylase the key enzyme of photosynthesis functions as oxygenase at high temperature and high oxygen concentration ,

      (b) it catalyses oxidation of RuBP into one molecule of 3C compound phosphoglyceric acid and one molecule of 2C compound phosphoglycolate ,

      (c) phosphoglycolate is rapidly converted into glycolate and transported to peroxisomes ,

(d)   in peroxisomes glycolate is oxidized to glyoxylate, glyoxylate is converted into amino acid glycine and transported to mitochondria ,

(e)   in the mitochondria two molecules of glycine give rise to one molecule of serine with the liberation of one molecule of CO_2 ,

(f)   serine is sent into peroxisomes where it is converted into glycerate and than sent into chloroplast ,

(g)   glycerate is phosphorylated to form phosphoglycerate which enters Calvin cycle
        $= ½ × 7 = 3½$

(ii)   chloroplast , peroxisomes , mitochondria = 1½

                                                        [3½ + 1½ = 5 marks]

27.   Somatic hybridisation : Process of producing somatic hybrids by fusion of somatic cells of two species / varieties = 1

Process :

a)   removal of cell wall by digestion with <u>pectinase</u> and <u>cellulase</u> = 1

b)   (free) protoplast formed = 1

c)   fusion between protoplasts of the selected parents is induced by a solution of polyethylene glycol (PEG) or by a very brief high voltage electric current to form a somatic hybrid = 1

d)   when somatic hybrids are cultured on a suitable medium they regenerate cell walls and begin to divide to finally produce plantlets = 1

                                                        [1 + 4 = 5 marks]

OR

(i)   Biopesticides : Biological agents / micro organisms that are used for control of weeds, insects and pathogens = 1

Examples :

The bacterium Bacillus thuringiensis , was the first biopesticide to be used on a commercial scale in the world. Spores of this bacterium produce the insecticidal Cry protein. So spores of this bacterium kill larvae of certain insects = 1

The microorganisms used as biopesticides include viruses, bacteria, fungi, protozoa and mites = 1

(ii)   Mycorrhiza: Symbiotic association between the fungus and the roots of higher plants = 1

These fungi solubilise phosphorus / produce plant growth promoting substances / protect host plants from soil pathogens = 1

                                                        [3 + 2 = 5 marks]

28. Carbon dioxide is transported in the blood in three ways

(1) In dissolved state, carbon dioxide is transported being dissolved in the plasma of blood = ½

(2) In the form of bicarbonate — carbon dioxide passes into the red blood corpuscles where it reacts with water to form carbonic acid (H_2CO_3) = ½

The enzyme carbonic anhydrase found in the erythrocytes catalyses this reaction = ½

Instantaneously after its formation carbonic acid dissociates into Hydrogen (H^+) and bicarbonate (HCO_3^-) ions = ½

The hydrogen ions (H^+) released from carbonic acid combine with haemoglobin after its dissociation from the potassium ions = ½

The most of bicarbonate ions (HCO_3^-) formed within the erythrocytes diffuse out into the plasma along a concentration gradient. These combine with haemoglobin to form the haemoglobinic acid (H.Hb) = ½

In response, chloride ions (Cl^-) diffuse from plasma into the erythrocytes to maintain the ionic balance // ionic balance is maintained by chloride shift = ½

<u>Figure</u> Carbon dioxide transport, chloride shift = ½ + ½

[CA = Carbonic anhydrase]
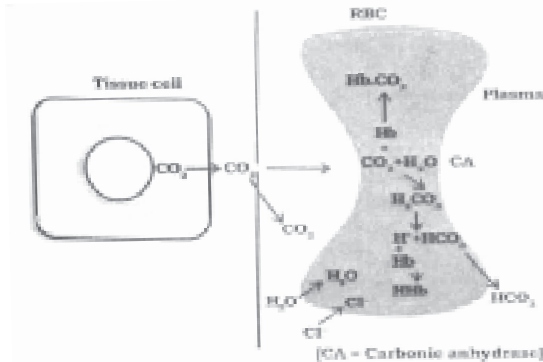
(Above points shown in a flow chart may be accepted)

(3) In combination with amine group of protein carbon dioxide reacts directly with the haemoglobin molecule and forms a carbaminohaemoglobin ($HbCO_2$) molecule = ½

[½ + 4 + ½ = 5 marks]

OR

(i) The pumping action during single cardiac cycle involves following steps:

(a) Atrial systole :

Blood enters into right atrium through superior as well as inferior vena cava and coronary sinus. The pulmonary veins bring blood to left atrium from lungs. During atrial systole both atria contract forcing the blood into both of the ventricles = ½

(b)   Ventricular filling :

The moment the atrioventricular valve opens nearly one-third of the ventricle is filled. Rest of the ventricular filling takes place during the contraction of the atria = ½

(c)   Ventricular systole :

The semilunar valve opens. The blood is pumped through the pulmonary artery to the lungs and through the aorta to the rest of the body = ½ + ½ = 1

(d)   Ventricular diastole :

The semilunar valves close to prevent back flow of blood from aortas. At the same time , the AV valve opens to allow the flow of blood from both the atria to the respective ventricles (½ + ½) = 1

(ii)   The first sound (lubb) , is created by the closure of the atrioventricular valves (immediately after the start of the ventricular systole) , = ½ + ½

The second sound (dubb) , is created by the closure of the semilunar valve (at the end of the ventricular systole) = ½ + ½

[3 + 2 = 5 marks]

BIOTECHNOLOGY

Time allowed : 3 hours   *Maximum Marks : 70*

General Instructions :

(i) All questions are compulsory.

(ii) There is no overall choice. However, an internal choice has been provided in one question of three marks and three question of five marks. You have attempt only one of the choice in such questions. Questions paper contains four sections - A, B, C and D.

*(iii) Question numbers **1** to **5** are very short answer questions, carrying **1** mark each.*

*(iv) Question numbers **6** to **15** are short answer questions, carrying **2** marks each.*

*(v) Question numbers **16** to **25** are also short answer questions, carrying **3** marks each.*

*(vi) Question numbers **26** to **28** are long answer questions, carrying **5** marks each.*

(vii) Use of calculators is not permitted. However, you may use log tables, if necessary.

QUESTION PAPER CODE 99/1

Section - A

1. How can self-ligation be prevented during recombinant DNA preparation ?   1

2. Point out the defect in the following procedure :

    A bacterial culture was placed in a polypropylene tube and the latter presevered in liquid nitrogen.   1

3. A laboratory had only one incubator without carbon dioxide facility. Therefore both animal cells and *E.coli* cells were grown in it. The animal cells perished while *E.coli* cells grew. Why ?   1

4. Indicate how can large amounts of one of the strands of a double stranded DNA fragment be generated using any cloning vector ?   1

5. List four recombinant proteins and their medical applications.   1

Section-B

6. What is 'Molecular Pharming' ? Why is it a preferred method than purifying proteins from slaughter house materials ?   2

7. The use of Taq polymerase in the PCR technique has eliminated the need to replenish enzyme after each cycle. Explain.   2

8. What are SNPs ? Suggest any one application of their study.   2

9. Differentiate between batch and continuous cultures.   2

10. Suggest any four applications of plant cell culture techniques.   2

11. Based on microscopic observations, how a pathologist can differentiate between cancerous and non-cancerous cells ?   2

12. Suggest any two reasons why milk proteins are better than other natural proteins with respect to nutritive value ?   2

13. What is the principle underlying the FISH technique ?   2

14. Enumerate the various techniques used to count cell number in microbial cultures. Which of these methods measures live cells ?   2

15. How do media for large-scale microbial culture differ from that used in a laboratory ?   2

Section - C

16. What purpose does subtilisin serve as a part of laundry detergents ? Why and how is the wild type version of subtilisin modified to be used in such detergent preparations ?   3

17. Why are plasmid-based vectors ideal for cloning ? Give three reasons.   3

18. Are "*in silico*" based gene prediction methods accurate ? Suggest any two reasons to support your reply.   3

19. Why is aeration essential for large-scale bacterial growth ? How is it achieved in fermentors ?   3

20. Differentiate between primary and secondary metabolites in plants. Give two examples of the latter.   3

21. What are stem cells ? Give two sources of stem cells. Why is stem cell technology so exciting ?   3

22. A bacterial culture grows in a fermentor of capacity 1000 L. The cells are harvested and 2 gm of a protein of molecular weight 10,000 is obtained. If each bacterial cell contains 2000 molecules of the protein, what are the total number of bacterial cells harvested ? Also calculate the percentage volume of the fermentor occupied by the cells. Assume that each bacterial cell has a diameter of 1 μm and length 2 μm.   3

23. You need to sequence a small RNA virus (single stranded). Suggest in outline how you would obtain the sequence if only DNA sequencing facility is available in your laboratory.   3

Or

Suggest any three reasons why genome sequencing projects are undertaken ?

24. Why are monoclonal antibodies preferred over serum antibodies in diagnosis and therapeutics ? Give an example of a therapeutic use of monoclonal antibodies.   3

25. Differentiate between structural and functional genomics.   3

Section - D

26. What are the various non-covalent forces found in protein structures ? Write a few lines on each of these. Disulfide bonds are frequently seen in proteins. How are these formed and can these be included in non-covalent forces ?   5

Or

What are nutraceutical proteins ? Name any two such protein preparations and explain their uses.   5

27. What are restriction enzymes and why are they called so ? Who discovered these ? How are these named ? Describe with a suitable example their different specificities in recognising and cutting DNA sequences.   5

28. What are transgenic plants ? Give examples (any four) of various transgenic plants with their special characteristics.   5

Or

Describe molecular breeding. Explain various types of markers used in screening/ selection.   5

QUESTION PAPER CODE 99

SECTION A

1. It is required to make a large amount of one of the strands of a DNA fragment for sequencing purpose. Suggest a strategy.   1

2. In isolating recombinant insulin from a culture of *E. coli,* the cells were filtered and the filtrate was subjected to a purification protocol. However no insulin was obtained. Why ?   1

3. Name four medically useful recombinant proteins.   1

4. If the vector and DNA fragment are generated using the same restriction enzyme, how can self-ligation be prevented ?   1

5. Animal cells were cultured in a peptone-glucose broth. They failed to grow and died. Why ?   1

SECTION B

6. Protein-based products are useful in everyday life. Give one application each of any two such products.   2

7. What are the three important steps in the PCR technique and how does the use of Taq polymerase help ?   2

8. SNPs can be used to understand genomic variations in responses to medicines. Explain.   2

9. If one wishes to obtain intracellular metabolites, what type of microbial culture technique should be used and why ?   2

10. Suggest any two applications of plant cell culture techniques.   2

11. How can cancerous cells be detected in a biopsy ?   2

12. Why is milk a suitable source of nutrients during early growth in mammals ?   2

13. How can CML (chronic mylogenous leukemia) patients be identified by the FISH technique ?   2

14. Mention any three techniques used to count microbes in a culture. Which techniques can measure live cells ?   2

15. List the various components of large-scale microbial culture media.

SECTION C

16. What are essential amino acids ? Which among these - casein, egg protein, soya protein, rice protein, wheat protein and whey protein - is a better nutritional protein and why ?   3

OR

How are protein fingerprint databases useful ? Briefly indicate the principle of 2-D gel electrophoresis.   3

17.	Compare plasmids with bacteriophages as vectors for cloning.	3
18.	Do you think *'in silico'* based gene prediction techniques are accurate ? Support your answer with reasoning.	3
19.	How is aeration of microbial cultures achieved in laboratory and in fermentors ?	3
20.	What are secondary metabolites ? Suggest any four secondary metabolites which are useful in medicine.	3
21.	Differentiate between polyclonal and monoclonal antibodies. Which type of antibody is used therapeutically ? Briefly describe its use.	3
22.	Bacterial cells harvested from a 500 L capacity fermentor yield 5 gm of a protein of molecular weight 15,000. If each bacterial cell contains 2500 molecules of the given protein, calculate the total number of bacterial cells harvested. Also calculate the percentage volume of the fermentor occupied by the cells assuming each cell is 1 μm in diameter and 2 μm in length.	3
23.	Many viruses have RNA based genomes. Outline how the single stranded RNA sequence of a given virus can be determined using DNA sequencing methods.	
24.	What are the main branches of genomics ?	
25.	Stem cell technology is potentially very exciting. Why ? Give three sources of stem cells.	3

SECTION D

26.	The enzyme chymotrypsin is inactivated by organophosphates. Why ? How is this enzyme able to catalyse the hydrolysis of proteins ? Indicate the mechanism of action with the help of a diagram.	5

OR

	Draw a labelled diagram of a mass spectrometer. Explain the principle underlying its use to determine the mass of peptides. Indicate one method by which protein samples can be prepared for analysis by mass spectrometry.	5
27.	Why are Restriction enzymes called 'Molecular Scissors' ? Indicate the properties of these enzymes highlighting their role in recombinant DNA technology.	5
28.	Describe 'Molecular Breeding' including various types of markers used in screening/selection.	5

OR

	How has use of recombinant DNA technology conferred beneficial traits to plants ? Explain.	5

Marking Scheme — Biotechnology

General Instructions

1   Instruction for drawing up the MS should be followed carefully.

2. If general Instruction have to be given, do so at the beginning of the page intself.

3. Some subject will require specific direction for a particular type of question. Give these at beginning of the concerned question. Don't omit indication of value points, times required for any of the question, even though it may seem obvious.

QUESTION PAPER CODE 99/1

EXPECTED ANSWERS/VALUE POINTS

Section A

1. Removal of $5'$ PO_4^- from either vector or insert before ligation using alkaline phosphatases.

    Or   (Any one)

    using 2 different restriction enzymes.   1

2. The cryoprotective agent/DMSO/glycerol has not been added before freezing

                                                                   (Any One)   1

3. Animal cells perished because in addition to constant temperature, they sequire:

    (a) continuous CO_2 supply

    (b) high relative humidity   ½+½ = 1

4. Using M13 based vectors, as they generate single stranded DNA   1

5. Recombinant Protein

    Medical application

    (Page 153, only one name, one application not four, as appears in the question

    papers)   ½+½ = 1

Section B

6. Creating transgenic animals by injecting DNA directly into ova or stem cells for producing desired proteins in milk.   1

Molecular charming _vis_ a _vis_ slaughter house

Ease of collection of source material

Low operational cost

High production capacity

Easy scaling up

(any 2 points)   ½+½ = 1

7. Taq polymerase is highly thermostable and does not get destroyed during the denaturation step. Hence there is no need to replenish the same.   2

8. Single Nucleotide Polymorphism. These are single nucleotide variations in gene sequences between individuals.   ½+½ = 1

    Application:

    (1) Severity of illness and the way the body responds to treatment can be determined.

    (2) Simple deletion in apoE gene - Alzheimer

    (3) CCR5 gene - resistance to AIDS/HIV

    (4) Important for diagnostics

    (5) Importance in population genetics.

    (any one)   1

9. | **Batch culture** | **Continuous culture** |
    |---|---|
    | (1) All the nutrients are in limited quantity | One of the nutrient is in limited quantity |
    | (2) Cells no. tends to ↓ after a while, owing to accumulation of metabolite and depletion of nutrients | Cells can be grown at constant rate for extended period |
    | (3) Used for isolating intracellular metabolites | For biomass & metabolite production |

    (any two)   1+1=2

10. Micropropagation

    Producing virus free plants

    Producing artificial seeds

    Embryo rescue in interspecific & intergeneric hybrids

    Generating haploids & triploids

    Somatic hybrids & Cybrids

    In vitro germplasm conservation

    Somaclonal variations

    Production of secondary metabolites

    (any four)   ½×4 = 2

11. Cancerous cells:
    — pile on each other due to uncontrolled growth
    — are more rounded in shape   1+1=2

12. High biological values:
    — Protein efficiency ratio
    — AA profile (essential AA, BCAA)   1+1=2

13. <u>F</u>luorescence <u>in situ</u> <u>H</u>ybridization   ½

    Introduction of colour into chromosome using nick translation   ½

    Method explained briefly (DNAse I, DNA polymerase, fluorescent nucleotides)   1

14. Counting chamber/ATP measurement/coulter counter/wet wt./ turbidity/viable plate counts/ dry weight (any three)   ½+½+½

    viable plate counts/ATP measures live cells   ½

15.

Lab scale		**Large scale**	
(1)	synthetic, semi synthetic, commercial media can be used, which are costly	(i)	Media component should be cost effective
(ii)	The quality of different commercial media can vary	(ii)	Media must have consistent quality
(iii)	Certain media may not be available all around the year	(iii)	must be available round the year so as to meet production
(iv)	Method of sterilization-autoclaving	(iv)	Steam-sparging
(Page-101)		(any two)	½×4 = 2

Section C

16. Subtilisin is a protease and can digest a broad range of proteins that commonly soil the clothes.   1

    In the wild type, the enzyme activity is affected due to the oxidation of methionine, in the presence of bleach added to detergents.   1

    Modification : Site directed mutagenesis -methionine substituted by alanine.   1

17. (1) Origin of replication, therefore self replicating
    (2) Selectable markers such as antibiotic resistance
    (3) Multiple cloning site (Polylinker)
    (4) Small size permitting easy transformation.
    (any three)   1+1+1

18. No/Non-reliability   1

    Reasons: Prone to computational errors/algorithm limitations

              Non linear relationship between protein and gene

              No correlation between complexity of organism and the number of
              genes

              Overlapping genes, splice variants

              (any two)   1+1=2

19. O_2 is required to prevent anaerobic conditions   1

    for proper growth of microorganism and production of desired metabolite   1

    Mechanical stirrers/impellers/spargers   1

20. — Primary metabolites are required for basic metabolic processes examples
       sugar, lipids, amino acids, nucleic acid etc.   1
    — Secondary metabolites are derived from primary metabolites and are used
       in defence eg. Shikonin, taxol, alkaloids, resin, tannin   1
    (any two)   ½+½ = 1

21. The undifferentiated cells which can self-renew, proliferate and develop into any
    kind of cell.   1

    Sources : Embryo (ICM)/bone marrow/umbilical cord (any two)   ½+½ = 1

    Supply body parts, prosthetic implant, provide model cell systems for developing
    new therapeutic approaches to human diseases. (any two)   ½+½ = 1
    Page-157

22. 2 g of protein has $\dfrac{2 \times 6.023 \times 10^{23}}{10,000}$ molecules of proteins

    If each bacterial cell has 2000 molecules then no. of cells

    $$= \frac{2 \times 6.023 \times 10^{23}}{10,000 \times 2,000} = 6.023 \times 10^{16} \text{ cell}$$ 1½

    Volume of 1 cell $= \dfrac{22}{7} \times 0.5^2 \times 2 \times 10^{-18} m^3 = 1.57 \times 10^{-18} m^3$

    Therefore, Volume of 6.023×10^{16} cells $= 6.023 \times 10^{16} \times 1.57 \times 10^{-18} m^3$

    $$= 9.46 \times 10^{-2} m^3$$

    $$= 94.6 \text{ L}$$ 1

    % Volume occupied $= \dfrac{94.6}{1000} \times 100 = 9.46\%$ ½

23. Reverse transcriptase, convert to cDNA 1

Then DNA sequencing by Sanger's method (brief details) 1½

In sequence replace T with U. ½

Page-78

OR, Provides basis for the discovery of all the genes Sequence shows relationships between genes. Provides set of tools for future experimentation.

Sequence provides an index to draw and organize all genetic information about the organism.

Whole genome sequence is an archive for the future (Any Three) 1+1+1

24. Monoclonal antibodies bind very specifically to an epitope on an antigen. Therefore, by using these, one can detect the presence of specific antigens in diagnostics. Those derived from serum are polyclonal and non specific. 1

Example - therapeutic OKT3. ½

A surface antigen CD3 is exposed on mature T-lymphocytes. Depleting the patients of all mature T cells abolishes cellular rejection of the transplanted organ. An antibody directed against CD3 surface antigen of T cells, called OKT3 (anti CD3 MoAb) removes antigen bearing cells from circulation and from the graft. Also, to protect or block specific antigen from being bound to other molecules. 1½

25. **Structural**   **Functional**

(1) Involves high throughput DNA   (1) Reconstruction of genome
    sequencing, assembly, organization
    and management of DNA
    sequences.

(2) Generates high resolution genetic, (2) Determine biological function
    physical and transcript map of   of genes and proteins
    an organism.

(3) Involves determination of 3-D   (3) Involves statistical and
    structure of all proteins   computational analysis

½×6 = 3

Section D

26. Noncovalent forces

(1) Ionic bonds
(2) Hydrogen bonds
(3) Van der Waal's force
(4) Hydrophobic interaction
    (Briefly explain)

P-30 &31 1×4 = 4

No, the disulfide bonds are not non-covalent bonds

Or

Disulfide bonds are covalent bonds. 1

OR,

Combines nutrition with pharmaceutical properties (therapeutic) 2

e.g. curds, whey (give details) 1½+ 1½

Page - 30 & 31

27. Restriction enzymes cut DNA at specific sequences, called so because they cut foreign DNA restricting growth of viruses in bacterial cells 1½

Arber, Smith and Nathans (any one) ½

Nomenclature and explain with an example (P - 45) 1

One example each for blunt and sticky ends (P - 46) 1+1

28. Plants containing foreign genes to produce foreign molecules and new traits 1

Four examples with their characteristics (P - 129) 1×4

OR,

Plant breeding assisted by molecular (DNA) markers. Molecular markers identify particular locations in the genomes and develop genetic markers tightly linked to genes (traits). 2

Morphological marker

Biochemical marker

Molecular marker 1+1+1

(a few lines on each as given on Page 135)

QUESTION PAPER CODE 99

EXPECTED ANSWERS/VALUE POINTS

SECTION-A

1. **Any one method** 1. M13 based vector
     2. Denaturation and separation of two strands
     3. PCR

     1

2. Insulin is intracellular protein. 1

3. t-PA,EPO, Factor VIII, Factor IX, FSH, Monoclonal Ab (Any 4) ½×4 =1

4. Alkaline phosphatases should be used to remove 5' phosphate from vector. 1

5. Animal cells require serum for growth. 1

SECTION-B

6. Any two products with application as on Page-28. 1+1

7. Denaturation, Renaturation (Annealing) and Extension. 1½

   Taq polymerase is thermostable. ½

8. SNPs are variations between individual genome sequences at single base positions and are inherited. 1

   Response (or lack of it) to a medicine can be correlated with specific SNP's and can be used for treatment. 1

9. Batch cultures Fed-batch culture (any one) is better for harvesting larger amount of cells from which metabolites are to be obtained. 1

   Here, the cells are allowed to grow to a maximum and then harvested increasing the source material. 1

10. Any two - micropropagation, virus free plants, artificial seeds, somatic hybrids etc.

    Page-122 1+1

11. Concerous cells are :
    (1) Rounded in shape
    (2) Piled up, due to lack of contact inhibition. 1+1

12. Milk proteins have all the EAA which have to be obtained from diet. 1
    This includes BC AA which are required for growth. 1

13. If the karyotype of lymphocyte between CML patients and normal is compared, there is a chromosome 9 and 22 reciprocal translocation. ½

    A DNA fluorescent probe of green color can be hybridized to the translocated segment of chromosome 9 and another with a different color to chromosome 22 (red). ½

    If there is reciprocal translocation and the hybridized probes are together then the color becomes yellow. Otherwise, on each chromosome they appear green or red. 1

14. Cell counting techniques - slide counting method, dry cell mass, wet weight of cells, turbidity measurements, ATP measurement, viable cell count and coulter counter (any 3 of above)   ½+½+½

Viable cell count / ATP measurement (any one)   ½

15. Any 4 -   Carbon source - cereal, starch
            N_2 source - urea, NH_4
            Trace elements - Fe, Cu, Mn, Mo
            Growth factors - Amino acids
            Antifoams - prevents frothing   ½×4=2

SECTION- C

16. EAA have to be obtained only from diet, can not be synthesized in body.   1
    Whey protein is best with respect to essential amino acid content and BCAA.   1+1

OR

As more and more protein fingerprint data become available, they are organized into databases. If a new protein fingerprint is determined it can be compared with the database to give information on uniqueness, similarity or any other relationship.   1

Principle of 2-D→ (1) Proteins are subjected to isoelectric focusing in one dimension. Proteins get separated based on different isoelectric point.   1

(2)   The separated proteins are electrophoresed at right angle using SDS PAGE wherein separation is based on molecular weight.   1

(3)   A 2-D pattern is obtained after staining.

17. Plasmids and phage vectors are similar in respect to:
    (1)   self replicating
    (2)   can incorporate inserts due to cloning sites
    (3)   selectable markers   1½

Differ with respect to:
    1.   Phage vectors due to natural infectivity are better transforming agents.
    2.   Phage vectors can carry larger inserts.
    3.   Plasmids can be easily manipulated in comparison to phage vectors

                                            1½

18. Gene prediction algorithms are inaccurate.   1

    Reason :

    1.   Based on experimental identification of genes and products and then comparisons, so unknown genes can not be enumerated.

    2.   A given gene due to splice variants can give rise to several proteins.   1+1 = 2

19. In laboratory culture

    (1) shaking   (2) baffle flasks   1½

    In fermentors (1) stirring   (2) spargers

    (if one point for each is referred then 1 mark if both then 1½)   1½

20. Secondary metabolites are generated in plant cells from primary metabolites and confer useful properties, but are not essential for metabolism and growth.   1

    Any 4 from list on Page-125.   ½×4 = 2

21. Polyclonal antibodies like those formed in serum are multispecific unlike, MoAb which are produced by hybridoma technology, are monospecific.   1

    Monoclonal is used therapeutically.   ½

    Eg. OKT-3 pg.-156 (explanation)   1½

22. 15,000 gms of protein (M. wt.) have 6.023×10^{23} molecules therefore 5 g of

    proteins have $\dfrac{5 \times 6.023 \times 10^{23}}{15,000} = 2.01 \times 10^{20}$ molecules   1

    1 bacterial cell has 2500 molecules

    therefore 2.01×10^{20} molecules are obtained from $\dfrac{2.01 \times 10^{20}}{2500} = 8.04 \times 10^{11}$ cells   1

    Volume of one bacterial Cell $= 3.142 \times 0.5 \times 0.5 \times 2$ um^3

                             $= 1.50 \times 10^{18}$ m^3

    8.04×10^{16} cells occupy $\rightarrow$ $8.04 \times 10^{16} \times 1.50 \times 10^{-18} \times 10^3$ L

          $= 126.2$ L

    % volume of fermenter occupied $= \dfrac{126.2 \times 100}{500}$

                            $= 25.2\%$ 1

23. 1.   RNA sequence converted to cDNA using reverse transcriptase

    2.   DNA sequence by Sanger's dideoxy method   1

    Briefly indicate reagents and method   2

24. Page-77 (details)   1½
Structural genomics   1½
Functional genomics

25. Stem cells can be used to generate various cell types and replace dead or defective cells causing disease. Burn victims can have epithelial cells replaced by tissue engineering.   Stem cells can someday be used to replace body parts damaged through disease.   2

Sources - embryo, bone marrow, cord blood (any two)   1

SECTION-D

26. Organophosphates alkylate Ser-OH, residue 195 which is essential for enzyme action

Mechanism - include catalytic triad Asp 102, Ser 195, His 57

Well labeled diagram of mechanism   1+1+3

OR

Diagram with label (Pg-25)   2

Principle - Separation based on different M/z ratios.   2
Details as on page 26.
Proteins can be volatilized by either MALDI or ES1 (any one)   1

27. Restriction enzymes cut double-stranded DNA at specific sequences   1

Properties :

(1) Recognize palindrome sequences usually 4-8 bp long   1½

(2) Cut within sequence either symmetrically or staggered (can use diagram) generating blunt or sticky ends.   1½

Sticky or blunt ends of two different DNA fragments generated by restriction enzymes can be ligated to form rDNA, recombinant vectors etc.   1

28. Def:- Details as per Pg-135
Plant breeding assisted by molecular (DNA) markers. These are used to identify genome sequences.   2

Markers used in screening/selection.
(1) Morphological
(2) Biochemical
(3) Molecular   1+1+1

Recombinant DNA technology can be used to produce transgenic plants with beneficial traits by introducing foreign genes.   1

Various beneficial traits (any four of the following with examples).
(1) Herbicide tolerance
(2) Insect resistance
(3) Virus resistance
(4) Delayed ripening
(5) Male sterile plants
(6) Abiotic stress tolerance   1×4

INFORMATICS PRACTICES

Time allowed : 3 hours   *Maximum Marks : 70*

> **NOTE :**
>
> *1. This question paper is divided into 3 sections.*
>
> *2. Section — A consists of 30 marks.*
>
> *3. Section — B and Section — C are of 20 marks each.*
>
> *4. Answer the questions after carefully reading the text.*

QUESTION PAPER CODE 90/1

Section — A

1. Answer the following questions ?

(a) Explain the term Metadata using suitable example.   2

(b) What is a Financial Accounting system ? Name any two entities or tables
that could be a part of this system.   2

(c) What is feasibility study with reference to SDLC ? Explain.   2

(d) Explain the concept of object-oriented modeling.   2

(e) Define Data Warehousing using suitable example.   2

2. Answer the following questions :

(a) What do you understand by the term Event Driven Programming ? Explain. 2

(b) Write the names of any two properties and any two methods, which are
common to the checkbox object and option button object.   2

(c) Differentiate between the DriveListBox and DirListBox. Also name the
most important property of each of these controls, which needs to be set
by the user.   2

(d) What is the purpose of the Common Dialog control ? List any two
methods of the Common Dialog Control.   2

(e) What do you understand by the term data-bound controls ? Name any
two data-bound controls that can be used on a form.   2

3. Answer the following questions :

(a) What do you understand by the term Equi-Join ? Give an example.   2

(b) Explain the difference between the SUBSTR and INSTR function of
SQL with the help of an example.   2

(c) What are group functions of SQL ? Name any two group functions.   2

(d) Differentiate between the COMMIT and ROLLBACK commands of SQL.   2

(e) Explain the usage of the IN OUT parameter of a PL/SQL procedure with
the help of an example.   2

Section - B

4. Read the following case study and answer the questions that follows :

The Pizza Cafe has computerized its billing. The following is the data entry screen used at their outlet. The outlet offers two different types of pizzas, regular and pan pizzas. The price of a regular pizza is Rs. 90 and that of a pan pizza is Rs. 110. The user can choose to have three different types of extra toppings if he wants. Each extra toppings costs Rs. 20.

The list for the above form is as follows :

Object Type	Object Name	Description
Form	frmPizza	The Main Form Object
Text Box	txtName	To enter name of the customer
	txtQty	To enter number of pizzas
	txtRate	To display rate of one pizza depending on its type
	txtTopping	To display cost of toppings
	txtAmount	To display total amount
Option Buttons	optRegular	To specify regular pizza
	optPan	To specify pan pizza .
Check Boxes	chkCheese	To specify cheese topping
	chkCap	To specify capsicum topping
	chkPep	To specify pepperoni topping
Command Buttons	cmdRate	To calculate rate of pizza
	cmdAmount	To calculate the total amount
	cmdExit	To close the application

(a) Write the commands to disable the textboxes txtRate, txtTopping, txtAmount and cmdAmount. 2

(b) Write the code for cmdRate to calculate the rate of the pizza and display it in txtrate depending on the type of pizza selected by the customer. It should also enable the cmdAmount button. 4

(c) Write the code for cmdAmount to calculate the total amount and display it in txtAmount. The total amount is calculated by first finding the cost of extra toppings selected by the customer. Remember that each extra topping costs Rs. 20 therefore if the user selects 2 toppings the cost of the toppings will be Rs. 40. Then add it to the rate and multiply the resultant amount by the quantity ordered. 4

5. Answer the following questions :

(a) Find the errors from the following code segment and rewrite the corrected code underlining the correction made. 2

```
Dim num=10, I as Integer
I = 1
Do While I < 5
        I = 1 + 2
    If num > 15
      num = 0
    Else
      num = num - 3
    End If
End While
```

(b) Give output of the following statements : 2
  (i)   INSTR (LTRIM ("   INTERNATIONAL"), "na")
  (ii) INT (4 - 7 * 3 / 2 + 5)

(c) Change the following code using FOR loop without effecting the output: 2
  DIM count, ans

  ans=l
  count=20
  DO
  ans=ans*count
  count=count-2
  LOOP UNTIL count <=10
  Print ans

(d) Write a Visual Basic procedure which takes a number as argument and displays whether it is prime or not. A prime number is one, which is not divisible by any number other than by 1 and by itself. 4

Section - C

6. Read the questions given below and answer accordingly :

(a) Write the output produced by the following part of code in PL/SQL : 2

```
DECLARE
      A NUMBER:=10;
      B NUMBER:=2;
BEGIN
      WHILE B < 12 LOOP
           IF A>B THEN
                    DBMS_OUTPUT.PUT_LINE (TO_CHAR(A) );
           ELSE
                    DBMS_OUTPUT.PUT_LINE(TO_CHAR(B) );
           END IF;
           A : = A - 4;
           B : =B + 3;
      END LOOP;
END;
```

(b) Find the errors from the following PL/SQL code and rewrite the corrected code underlining the correction made. 2

```
CREATE ASWELLAS REPLACE TRIGGER DEPT_UP
   AFTER UPDATE ON DEPT FOR EVERY ROW
DECLARE
     v_num   NUMBER (3);
BEGIN
     SELECT COUNT (*) INTO v_num FROM Emp WHERE Dept = '101';
IF v_num>5
   Raise_application_error (-20001, 'Cannot exceed 5');
END;
```

(c) What do you understand by %ROWCOUNT with reference to cursors ? What will happen if you use the %ROWCOUNT attribute of a cursor that is not open ? 2

(d) Write a PL/SQL procedure called FACTORIAL that takes an integer as parameter, finds its factorial and display it. (Factorial of a number is the product of all whole numbers less than and equal to that number.) For example, factorial of $4 = 4 \times 3 \times 2 \times 1 = 24$). 4

7. Answer the questions based on the table CLUB given below :-

Table : CLUB

Column Name	Data Type	Size	Constraint	Description
Member_No	NUMBER	4	PRIMARY KEY	Member Number
Member_Name	VARCHAR2	30	NOT NULL	Name of the member
Address	VARCHAR2	30		Address of the member
Age	NUMBER	3	>=18	Age of the member
Type	VARCHAR2	10		Type of membership
Fees	NUMBER	6,2		Membership fees

(a) Write the SQL command to create the table Club including the constraints.   2

(b) Write the SQL command to display the details of the all the members whose type is "Permanent" and fees is more than Rs. 1000.   2

(c) Write a PL/SQL code to increase the fees by 5% for a member number accepted from the user if the type of the membership is "Temporary".   3

(d) Write PL/SQL code using an explicit cursor to display the details of all the "Permanent" members whose age is greater than 50. The code should also display the average membership fees of all such members.   3

QUESTION PAPER CODE 90

SECTION A

1. Answer the following questions :

(a) Explain the term Data Dictionary using suitable example.   2

(b) What is an Inventory control system ? Name any two entities or tables that could be a part of this system.   2

(c) What do you understand by a Many-to-one relationship ? Explain with example.   2

(d) Expand the term UML and explain its usage.   2

(e) Explain the concept of client-server computing with the help of examples.   2

2. Answer the following questions :

(a) What do you understand by the term IDE ? Why is Visual Basic called an IDE ?   2

(b) Write the names of any two properties, which are .common to textbox object, label object and command button object.   2

(c) Differentiate between the Load and Show methods of a form object. 2

(d) What is the purpose of the ADO Data Control ? Name the two properties of the ADO Data Control that can be dynamically set during run-time to change the database. 2

(e) Differentiate between a form module and class module of Visual Basic. 2

3. Answer the following questions :

(a) What are DCL commands ? Name any two DCL commands. 2

(b) State the difference between SQL and PL/SQL. 2

(c) Explain the usage of NEXT_MONTH function of SQL with the help of an example. 2

(d) What is the use of the %ROWTYPE attribute ? Explain with the help of an example. 2

(e) What is a trigger ? Name two types of triggers available in PL/SQL. 2

SECTION B

4. Read the following case study and answer the questions that follow :

The Shop n Save store has developed the following data entry screen for its operations. The store offers three different types of membership discount schemes for its regular customers. Platinum members get a discbunt of 10% on all their purchases, Gold members get 59& and Silver members get 3% discount.

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The list for the above form is as follows :

Object Type	Object Name	Description
Form	frmCust	The Main Form Object
Text Box	txtProduct	To enter name of the product
	txtQty	To enter quantity sold
	txtRate	To enter rate per unit of the product
	txtAmount	To display the total amount as quantity * rate
	txtDiscount	To display the discount amount based on membership type
	txtNet	To display net amount as amount - discount
Option Buttons	optPlatinum	To specify Platinum membership
	optGold.	To specify Gold membership
	optSilver	To specify Silver membership
Command Buttons	cmdCalc	To calculate the amount, discount and net amount
	cmdExit	To close the application

(a) Write the commands to disable the textboxes txtAmount, txtDiscount and txtNet.   1

(b) Write the code for cmdCalc to calculate the amount, discount and net amount as per the given descriptions and conditions.   4

(c) Write the command to remove the decimal part from the textbox txtNet so that the net amount contains only the integer portion in Rupees.   1

(d) Write the code for cmdExit to close the application; but before the application is closed it should check the net amount and if the net amount > 10,000 the membership of the customer should be upgraded to the next higher level and a message- box informing the customer should be displayed. For example if the customer already has Silver membership it should be upgraded to Gold and he should be informed of the same using a message box.   4

5. Answer the following questions :

(a) Find the errors from the following code segment and rewrite the corrected code underlining the correction made :   2

```
Private  Sub  Changer  (a  ;  b  as  Integer)
  c=a+b
  Select  Case  c
    Case  1
      Print  "Good"
    Case  2,3
      Print  "Average"
    Default  Case
      Print  "Poor"
Sub  End
```

(b) Give output of the following statements :   2

(i) UCASE(MID("Advertisment",7,3))

(ii) (3 * 4 > 3 + 5) AND (2 ^{A} 3 + 7 / 2)

(c) Change the following code using DO..WHILE without effecting the output :   2

```
DIM  arr(5)
counter=l
DO  UNTIL  counter  >  5
arr(counter)  =  counter  *counter
  IF  counter  =  2  THEN
    Print  arr(counter)
  END  IF
counter  =  counter  +  1
LOOP
```

(d) Write a Visual Basic procedure which takes a number as argument and displays the reverse of the number. For example if the argument passed is 1357 it should display 7531.   4

SECTION C

6.   Read the questions given below and answer accordingly

(a) Find the output of the. following code in PL/SQL :   2

```
DECLARE
    X  NUMBER;=1;
    Y  NUMBER;=6;
    Z  NUMBER;
BEGIN
    LOOP
      Z:=X*Y;
      IF  X+Y<  10  THEN
        DBMS_OUTPUT.PUT_LINE(TO_CHAR(Z));
```

```
                ELSE
                   EXIT;
                END  IF
                X:=  X +  3;
                Y:=  Y -  2;
             END  LOOP;
        END;
```

(b) Find the errors from the following PL/SQL code and rewrite the corrected
     code underlining the correction made :   2

```
DECLARE
     v_no Emp.EName%ROWTYPE;
     v_sal  NUMBER(7,2)=1000;
BEGIN
     LOOP
        SELECT Sal TO v_sal FROM Emp WHERE Eno=v_no;
     v_no  =  v_no  +  1;
     EXIT  FOR  v_no  >  5;
     END  LOOP;
END;
```

(c) Nanfe the different types of modes formal parameters can have in
     a PL/SQL procedure. If the   mode is not specified in a procedure
     what will be the default mode ?   2

(d) Write a PL/SQL procedure called MULTI_TABLE that takes two
     numbers as parameter and displays the multiplication of the first parameter
     till the second parameter.   4

7.   Answer the questions based on the table **Hospital** given below :

Table : **Hospital**

Column Name	Data Type	Size	Constraint	Description
P_No	NUMBER	4	PRIMARY KEY	Patient Number
Patient_name	VARCHAR2	30	NOT NULL	Name of the patient
Department	VARCHAR2	20		Department to which patient is admitted
Doc_name	VARCHAR2	30	NOT NULL	Name of the doctor
Dt.Birth	DATE			Date of birth of the patient
Consultation_Fee	NUMBER	5,2		Consultation fees

(a) Write the SQL command to create the table Hospital including the constraints. 2

(b) Write the SQL command to display the details of all the patients whose date of birth is after 1st Jan 2000 department wise. 2

(c) Write a PL/SQL code to decrease the consultation fees by 5% for a patient number accepted from the user if the year of birth of patient is before 1950. 3

(d) Write PL/SQL code using an explicit cursor to display the details of all the patients in the SURGERY department. The code should also display the total consultation fees of all such patients. 3

Marking Scheme — Informatics Practices

QUESTION PAPER CODE 90/1
EXPECTED ANSWERS / VALUE POINTS

Important Note:

All answers provided in the marking scheme are SUGGESTIVE.
Examiners are requested to accept all possible alternative correct answers.
In Section C, semicolon to be ignored for terminating SQL statements.

Section – A

1. (a) Meta Data is the data about the data.

    OR

    Meta Data is the information that describes the model and definition of the source data elements.
    Example: Data Dictionary

    (1 mark for the definition conveying the similar meaning)
    (1 mark for any correct example or explanation)
    OR
    (Full 2 marks for explaining with the help of example)

    (b) Financial Accounting System is a system used to record, measure, monitor, plan and control, and decision making.

    Entities: Ledger, Employee, Assets, Liabilities, Payroll, Department, AccountsRecievable, AccountPayable, Debit, Credit, Voucher (Any Two)

    (1 mark for the definition conveying the similar meaning)
    (1/2 mark each for correct entities)

    (c) Feasibility study is a study or survey used to determine whether the whole system that is to be designed and developed would be worth the effort or not.

    (2 marks for the definition/explanation conveying the similar meaning)

(d) Object Oriented Modeling is used to build models and perform various activities on it so as to develop a good Object Oriented system.

(2 marks for the definition/explanation conveying the similar meaning)

(e) Data Warehousing is a system for storing and delivering massive quantities of data.

OR

Data Warehousing is centralized data repository that stores and provides already transformed and summarized data.

Example:

Electoral Rolls Data, Citizen Data maintained in Government data warehouses, Organizational data.

(1 mark for the definition conveying the similar meaning)
(1 mark for any one correct example or diagrammatic representation)
OR
(Full 2 marks for explaining with the help of example)

2. (a) A programming methodology wherein code execution is based on occurrences of independent events.

(2 marks for the definition/explanation/example conveying the similar meaning)

(b) Name
Appearence
Backcolor
Enable
Font
Height
Index
Left
TabIndex
Tabstop
Tag
Top
Visible
Width

[Any two of the properties mentioned above]

(1 Mark for mentioning each of the common properties)

(c) DriveListBox is used to navigate all the drives of the system whereas DirListBox is used to navigate all the directories of the selected drive.

The important properties of the DriveListBox is Drive and DirListBox is Path.

(1 mark for any correct difference)

(1/2 mark each for correct properties)

(d) Common Dialog Control provides a standard way of adding a dialog box for various operations like opening files, saving files, print option, setting color & font, etc to an application.

The methods of the Common Dialog Control are ShowOpen, ShowColor, ShowFont, ShowPrinter, ShowSave during the run time (Any two valid methods).

(1 mark for any correct definition)

(1/2 mark each for any two correct methods)

(e) Data-Bound Control provides access to the required column(s) in a data source through a data control.

Textbox, Label, Listbox, Combobox, Checkbox, Image, DataGrid Control, DataBoundGrid Control are various data-bound controls that can be used on a form.

(1 mark for any correct difference)

(1/2 mark each for any two correct controls)

3. (a) Equi-Join is a join in which two columns of different tables are compared for equality.

For example: Emp(empno, name, deptno) and Dept(deptno, dname)

Select Empno, name, dname

From emp, dept

Where emp.deptno=dept.deptno;

OR

Any other example written using SQL or simple English.

(1 mark for any correct difference)

(1 mark for any correct example)

(b) SUBSTR retrieves the specified portion of a string whereas INSTR returns the starting position of the string mentioned in the second parameter in the string mentioned in the first parameter.

OR

SUBSTR returns character value whereas INSTR returns numeric value.

Example

SUBSTR("International", 6,3) will return nat

INSTR("International", "nat") will return 6

(1 mark for the definition conveying the similar meaning)

(1 mark for any one correct example or syntax)

OR

(Full 2 marks for explaining with the help of example)

(c) A Group function operates on a set of values in a table and returns a single value.

Example: AVG, MAX, MIN, SUM, COUNT (Any two).

(1 mark for any correct definition)
(1/2 mark each for any two correct examples)

(d) Commit saves the changes permanently whereas Rollback undo all the changes done till last Commit in the current session.

(2 Marks for correct difference)
OR
(1 Mark each for each correct definition/explanation)

(e) The value of the IN/OUT parameter is passed into the stored procedure, which can be updated within the procedure and returned from the procedure.

Example:

```
Create or Replace Procedure xyz(x IN OUT number) Is
Begin
x:=x*10;
End  xyz;
```

(1 mark for any definition conveying the similar meaning)
(1 mark for any correct example)

Section – B

4. (a)
```
txtRate.Enabled  =  False
txtTopping.Enabled  =  False
txtAmount.Enabled  =  False
cmdAmount.Enabled  =  False
```
OR

```
txtRate.Locked   =   True
txtTopping.Locked   =   True
txtAmount.Locked   =   True
cmdAmount.Enabled   =   False
```

(1 Mark for any two correct commands)

OR

(1/2 Mark for correctly identifying the correct property)

(b)
```
If  optRegular.Value  =  True  Then
  txtRate.Text  =  90
Else
  txtRate.Text  =  110
End  If
cmdAmount.Enabled  =  True
```

OR

```
If  optRegular.Value  =  1  Then
  txtRate.Text  =  90
Else
  txtRate.Text  =  110
End  If
cmdAmount.Enabled  =  True
```

OR

Any other equivalent code

(2 Marks for correct If statement)
(1 Mark for correct assignment of Rate)
(1 Mark for enabling the command button)

(c)
```
txtTopping.Text = 20 * (chkCheese.Value + chkCap.Value +
chkPep.Value)
txtAmount.Text = (Val(txtRate.Text) + Val(txtTopping.Text))
*  Val(txtQty.Text)
```

OR

```
Topping  =  0
If  chkCheese.Value  =  1  Then
    Topping  =  Topping  +  20
End  If
If  chkCap.Value  =  1  Then
    Topping  =  Topping  +  20
End  If
```

```
If  chkPep.Value  =  1  Then
    Topping  =  Topping  +  20
End  If
txtTopping.Text=Topping
txtAmount.Text  =  (Val(txtRate.Text)  +  Val(txtTopping.Text))
*  Val(txtQty.Text)
```

OR

Any other equivalent code

(2 Marks for calculating cost of Toppings)
(2 Marks for calculating Amount)

5.   (a)   **Corrected code:**

```
Dim  num,  I  as  Integer              'Error  1
num=10                                 'Error  2
I=1
Do  While  I<5
   I  =  I  +  2
   If  num  >  15  Then                'Error  3
      num  =  0
   Else
      num  =  num  -  3
   EndIf
Loop                                   'Error  4
```

(1/2 Mark for identifying and correcting each of the errors)
OR
(1 Mark to be given if all the errors are identified without correction)

(b)   (i)   0

(1 mark for correct output)
(1/2 mark if 6 is given as output instead of 0)

(ii)   -2

(1 mark for correct output)
(½ mark if the output is given as –1 or –3/2 or equivalent answer)

(c)   *(2 Marks to be given to all students who have attempted any part of Q5)*

Note: As the student are familiar with DO WHILE and FOR loops rather than DO UNTIL, therefore benefit of doubt should be given to the students

(d)
```
Private Sub procIsprime (n As Integer)
Dim f As Boolean
f = True
FOR i = 2 TO n - 1
   IF n Mod i = 0 THEN
      f = False
      EXIT FOR
   END IF
NEXT

If f = True Then
   Print n & " is a prime no"
Else
   Print n & " is not a prime no"
   END IF
End Sub
```

(1 Mark for header of sub procedure)
(1 Mark for using loop)
(1 Mark for checking divisibility by using MOD or / or \ or any other equivalent method)
(1 Mark for displaying the result)

Section - C

Q6   (a) Output:

10

6

8

11

(1/2 Mark for each correct output)
(1/2 Mark to be deducted for incorrect format)

(b) **Corrected Code:**

```
CREATE OR REPLACE TRIGGER DEPT_UP                   --Error 1
   AFTER UPDATE ON DEPT
FOR EACH ROW                                        --Error 2
DECLARE
v_num NUMBER(3);
BEGIN
   SELECT COUNT(*) INTO v_num FROM Emp WHERE Dept='101';
IF v_num>5 THEN                                     --Error 3
   Raise_application_error(-20001, 'Cannot exceed 5');
END IF;                                             --Error 4
END;
```

(1/2 Mark each for identifying and correcting the errors)
OR
(1 Mark to be given if all the errors are identified without correction)

(c) %ROWCOUNT is used to display the number of records that are processed by a cursor.

If the cursor in not open and %Rowcount is used then it will give an error (i.e. Invalid Cursor).

(1½ mark for correct definition/explanation)
(½ mark for error or invalid cursor)

(d)
```
Create or Replace Procedure Factorial(n in Number)
IS  fact  Number:=1;
Begin
For  i  In  1..n  loop
   fact  :=  fact  *  i;
End  Loop;
dbms_output.put_line('Factorial  is  '  ||  fact);
End  Factorial;
```

(1 Mark for header of procedure)
(1 Mark for using loop)
(1 Mark for calculating factorial)
(1 Mark for displaying the result)

7. (a)
```
CREATE  TABLE  CLUB  (  Member_No  NUMBER(4)  PRIMARY  KEY,
Member_Name  VARCHAR2(30)  NOT  NULL,
Address  VARCHAR2(30),
Age  NUMBER(3)  CHECK(Age>=18),
Type  VARCHAR2(10),
Fees  NUMBER(6,2)  );
```

(1 Mark for correct column definitions)
(1 Mark for correct constraints)
OR
(1/2 if only CREATE TABLE Club is written)

(b)
```
SELECT  *  FROM  CLUB
WHERE  Type=  'Permanent'  and  Fees>1000;
```

(1 Mark for selection)
(1 Mark for Where clause)

(c)
```
Declare
M  CLUB.Member_No%Type;
Begin
M:=&Memberno;
UPDATE  CLUB
SET  Fees  =  Fees  +  Fees  *  5/100
WHERE  Member_No=M  AND  Type  =  'Temporary';
End;
```

OR

```
Begin
UPDATE  CLUB
SET Fees  =  Fees  +  Fees  *  5/100
WHERE  Member_No  =  &Mno  AND  Type  =  'Temporary';
End;
```

(1/2 mark for correct declaration of variable(s))

(1/2 mark for accepting input)

(1 mark for UPDATE command)

(1 mark for WHERE clause)

(d)
```
Declare  CURSOR  Club_Cur  IS  SELECT  *  FROM  CLUB
                    WHERE  Type  ='Permanent'  AND  Age>50;
R  Club%Rowtype;
S  Number:=0;
Begin
Open  Club_Cur;
Loop
Fetch  Club_Cur  Into  R;
EXIT  WHEN  Club_Cur%NOTFOUND;
Dbms_Output.Put_Line (R.Member_No || '   ' || R.Member_Name
    || '   ' || R.Address ||'   '|| R.Age ||'   '|| R.Type
    ||'   '|| R.Fees);
S:=  S  +  R.Fees;
End Loop;
Dbms_Output.Put_Line ('Average  membership  Fees  is  '  ||
    S/Club_Cur%Rowcount);
Close  Club_Cur;
End;
```

OR

Any other equivalent code

(1/2 Mark for declaring the cursor)

(1/2 Mark for correct loop)

(1/2 Mark for fetching)

(1/2 Mark for correct output)

(1/2 Mark for calculating Total fees)

(1/2 Mark for calculating Average membership fees)

1. (a) The data dictionary is a database about data and database structures i.e. the metadata.

Example: When a user creates a table - the structure, date of creating, time, username etc is stored in User_tables table and this table is automatically updated at every creation/any alteration in the table.

(1 mark for the definition conveying the similar meaning)
(1 mark for any correct example or explanation)
OR
(Full 2 marks for explaining with the help of example)

(b) Inventory is the means by which all items are identified, priced and tracked. Inventory control management system is designed to maintain optimum inventory levels, control inventory costs, and track merchandise movement.

OR

Inventory Control system helps the organization to keep track of Order and Supply of Items/Stock in the organization.

Examples of Entities: Order, Supply, Purchase, Item, Stock, Customer, Department, Supplier, Vendor, Shipment, Transaction, Reorder, Requisition, Bill, Parts, BillofParts, Invoice (Any Two)

(1 mark for the definition conveying the similar meaning)
(½ mark each for any two correct entities)

(c) In a many-to-one relationship, many records in the first table may have one matching record in the second table, and each record of second table may have many matching records in the first table.

OR

Example:

OR

Example showing relationship with records from two different tables.

(1 mark for the definition conveying the similar meaning)

(1 mark for any correct example or diagrammatic representation or notation)

OR

(Full 2 marks for explaining with the help of example)

(d) Unified Modelling Language.

It is used to visually model the solution to a problem in an Object Oriented manner.

(1 mark for the correct expansion)

(1 mark for any correct usage or diagrammatic representation of data and methods)

(e) The client server computing represents a model wherein requests are made at client end and the services are provided by the other end known as server end.

Example:

Student (Client) accessing his Result information using a computer from School's Server

OR

Credit/debit Card Holder accessing his account information through ATM/ Bank client machine from the Bank Server machine.

OR

Visual Basic as Client Application and Oracle as Server

OR

Any other valid equivalent

(1 mark for the definition conveying the similar meaning)

(1 mark for any one correct example or diagrammatic representation)

OR

(Full 2 marks for explaining with the help of example)

2. (a) IDE means Integrated Development Environment.

OR

IDE combines Designing, Editing, Coding, Compiling, Debugging and Executing an application (Mention of any 2)

Visual Basic is an IDE because it combines Designing, Editing, Coding, Compiling, Debugging and Executing an application (Mention of any 2).

(1 mark for the fullform /definition conveying the similar meaning)

(1 mark for correct reason of why VB is IDE)

OR

(Full 2 marks for explaining with the help of VB IDE as example)

(b) Name

Appearance

Backcolor

Enable

Font

Height

Left

TabIndex

Tabstop

Tag

Top

Visible

Width

[Any two properties out of the properties mentioned above]

(1 Mark for mentioning each of the two common properties)

(c) Load Event occurs before a form is loaded for the first time.

Show Method loads (if it is not loaded) and displays the form.

OR

Load loads the form and Show displays the form.

(2 Marks for correct difference with respect to LOAD loads only and SHOW loads and displays)

OR

(1 Mark each for correct usage of Load and Show)

(d) The ADO data control is used to access all types of database whether relational or non-relational.

OR

The ADO data control is used to connect to a datasource.

Properties: Connection String, Recordset.Open

(1 mark for any definition conveying the similar meaning)

(1/2 mark each for correct properties)

(e) Form module contains variables, functions, procedures and events that pertain to the form.

Class module contains code that defines attributes and methods that implement object oriented programming concepts in Visual Basic.

(2 Marks for correct difference)

OR

(1 Mark each for correct definition of Form module and Class module)

3. (a) Data Control Language commands.

OR

The commands which are used to give or take away the rights or permissions to user(s) to use some or all the database resources.

Commands: Grant, Revoke

(1 mark for any definition conveying the similar meaning)
(½ mark each for correct commands)

(b) SQL does not have procedural capabilities while PL/SQL has procedural capabilities

OR

SQL does not have control structures while PL/SQL has control structures.

OR

Any other valid difference.

(Full 2 marks for any one correct difference)
OR
(1 mark for only giving correct full form of both)

(c) There are functions such as NEXT_DAY and ADD_MONTHS available in Oracle.

The question invites multiple answers from students hence all answers should be accepted

(2 marks to be given if mentioned that the function is not available)
OR
(2 marks to be given if the question is attempted with a substituted Date function or any equivalent explanation)
OR
(2 marks to be given if any two parts of Q3 are attempted correctly)

(d) %Rowtype gives record type representation of one row in a database table.

OR

%Rowtype is used for declaring a variable so that it can store the values of one row of table in it.

Example : emprec EMP%rowtype means emprec can store one row of EMP table.

(1 mark for any usage conveying the similar meaning)
(1 mark for any correct example)
OR
(Full 2 marks for explaining with the help of example)

(e) A trigger is a stored procedure/PL/SQL block that defines an action that the database automatically initiates when any database related DML event occurs.

Types: Row Level and Statement Level Triggers

(1 mark for any valid definition conveying the similar meaning)
(1/2 mark each for correct types)

SECTION B

4. (a) ```
txtAmount.Enabled=False
txtDiscount.Enabled=False
txtNet.Enabled=False
```

OR

```
txtAmount.Locked=True
txtDiscount.Locked=True
txtNet.Locked=True
```

(1 Mark for any two correct commands)
OR
(1/2 Mark for correctly identifying the correct property)

(b) txtAmount.text = Val(txtQuantity.text) * Val(txtRate.text)
if optplatinum.value = True then   'if optplatinum.value = 1 then
  txtDiscount.text = Val(txtAmount.text) * 10/100
elseif optgold.value = True then   'elseif optgold.value = 1 then
  txtDiscount.text = Val(txtAmount.text) * 5/100
else

```
            txtDiscount.text = Val(txtAmount.text)  * 3/100
    end if
    txtNet.  txtNet.text = txtAmount.text – txtDiscount.text

    OR

    Any other equivalent code
```

(1 Mark for calculating Amount)
(2 Marks for If statement)
(1 Mark for calculating txtNet)

(c)   txtNet.text = INT(txtNet.text)

OR

Any other equivalent function using any function(s) like ROUND, FIX, CINT

(1 Mark for correct command)

(d)
```
if Val(txtNet.text) > 10000 then
     if optSilver.value = True then
          optGold.value = True                          'optional
          msgbox "Upgraded to GOLD Membership"
     elseif optGold.value = True then
          optPlatinum.value = True                      'optional
          msgbox "Upgraded to PLATINUM Membership"
     End if
End if
End
```

OR..

```
if Val(txtNet.text) > 10000 then
     if optSilver.value = 1 then
          optGold.value = 1                             'optional
          msgbox "Upgraded to GOLD Membership"
     elseif optGold.value = 1 then
          optPlatinum.value = 1                         'optional
          msgbox "Upgraded to PLATINUM Membership"
     End if
End if
End
```

5. (a) <u>Corrected Program</u>

```
Private  Sub  Changer(a  as Integer,  b  as  Integer) 'Error 1
  c=a+b
  Select  Case  c
    Case  1
    Print  "Good"
  Case  2,3
    Print  "Average"
  Default  Case  Else                                 'Error 2
    Print  "Poor"
End  Select                                           'Error 3
Sub  End  Sub                                          'Error 4
```

(½ Mark for identifying <u>and</u> correcting each of the errors)
OR
(1 Mark to be given if all the errors are identified without correction)

(b) (i) ISM
(1 Mark for correct output)
OR
(1/2 Mark for output in lower case – ism)

ii) Ambiguity in response is expected. The correct result on execution of the statement in VB will be 12.
(1 Mark to be given for <u>attempting</u> ANY part of 5(b))

(c) *(2 Marks to be given to all students who have attempted any part of Q5)*

Note: As the student are familiar with DO WHILE and FOR loops rather than DO UNTIL moreover Control Arrays and not the concept of Arrays, therefore benefit of doubt should be given to the students

(d)
```
Private  Sub  reverse  (n  as  integer)
    Dim  a  as  string
    a  =  strReverse(str(n))
    print  a
End  sub
```

OR

```
Private sub reverse (n as integer)
   Dim a as integer, b as integer
   Do while (n > 0)
       a = n mod 10
       b= b * 10 + a
       n = n / 10
   loop
   print b
End sub
```

OR

```
Private sub reverse (n as integer)
   Dim a as integer, b as integer
   Do while (n > 0)
       a = n mod 10
       Print a;
       n = n / 10
   loop
   Print
End sub
```

OR

```
Private Sub reverse (n as integer)
   Dim a as string
   a = str(n)
   For b= Len(a) to 1 Step -1
       print Mid(a,b,1);
   Next
   Print
End sub
```

(1 Mark for header of sub procedure)
(3 Marks for using StrReverse and Str correctly for reversing the number)
OR
(1 Mark for header of sub procedure)
(1½ Mark each for loop and display the reversed number / digits)

SECTION C

6.   (a)   6
          16
          14

(1/2 Mark for each correct output)
(1/2 Mark for correct format of output)

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(b)
```
DECLARE
        v_no        Emp.EName%ROWTYPE;
        v_sal       NUMBER(7,2)=1000;
BEGIN
   LOOP
        SELECT Sal TO v_sal FROM Emp WHERE Eno=v_no;
        v_no = v_no +1;
        EXIT FOR v_no > 5;
   END LOOP;
END;
```

OR

```
DECLARE
        v_no        Emp.ENo%TYPE;                          — Error 1
        v_sal       NUMBER(7,2):=1000;                     — Error 2
BEGIN
   LOOP
        SELECT Sal INTO v_sal FROM Emp WHERE Eno=v_no;     — Error 3
        v_no := v_no +1;                                   — Error 4
        EXIT FOR WHEN v_no > 5;                            — Error 5
   END LOOP;
END;
```

(1/2 Mark each for identifying __and__ correcting any __four__ errors)

OR

(1 Mark to be given if all the errors are identified without correction)

(c) IN, OUT, IN OUT

Default is IN.

(1 Mark for mentioning any two of modes)
(1 Mark for correct default mode)

(d)
```
Create or replace Procedure multi_table ( n number, m number)
As
Begin
For a in 1..m loop
DBMS_OUTPUT.PUT_LINE (n * a);
End loop;
End ;
```

OR

```
Create or replace Procedure multi_table ( n number, m number)
As
Begin
For a in 1..m loop
DBMS_OUTPUT.PUT_LINE (a * a);
End loop;
End ;
```

OR

```
Create or replace Procedure multi_table ( n number, m number)
As
Begin
DBMS_OUTPUT.PUT_LINE (m * n);
End ;
```

(1 Mark for the procedure header)
(1 Mark for Begin and End)
(2 Marks for any valid multiplication)

7.　　(a)　Create　Table　Hospital
```
(P_No  Number(4)  Primary  Key,
Patient_Name  Varchar2(30)  NOT  NULL,
Department  Varchar2(20),
Doc_Name  Varchar2(30)  NOT  NULL,
Dt_Birth  Date,
Consultation_Fee  Number  (5,2))
```

(1 Mark for correct column definitions)
(1 Mark for correct constraints)
OR
(1/2 if only CREATE TABLE Hospital is written)

(b)　SELECT　*　FROM　Hospital
```
WHERE  Dt_Birth  >  '01-Jan-2000'
ORDER  BY  Department;
```
OR
```
SELECT  p_no,  patient_name,  Department,  Doc_Name,
Dt_Birth,  Consultation_Fee  FROM  Hospital
WHERE  Dt_Birth  >  '01-Jan-2000'
ORDER  BY  Department;
```

(1/2 Mark for selection)
(1 Mark for Where clause)
(1/2 Mark for Order By)
Note: All date formats are acceptable

(c) Declare

```
Pno Number (4);
Begin
    Pno := &no;
    UPDATE Hospital
    SET consultation_fee = consultation_fee – consultation_fee*.05
    WHERE p_no = pno AND Round(dt_birth, 'year') < 1950;
End;
```

OR

```
Declare
Pno Number (4);
Begin
Pno := &no;
UPDATE Hospital
SET consultation_fee = consultation_fee – consultation_fee * .05
WHERE p_no = pno AND dt_birth< '01-Jan-1950';
End;
```

(1/2 mark for correct declaration of variable)
(1/2 mark for input)
(1 mark for UPDATE command)
(1 mark for WHERE clause in UPDATE command)

(d) Declare

```
Cursor C1 is Select * from hospital where Department ='Surgery';
  patient_rec C1%rowtype;
  Total Number := 0;
Begin
  Open C1;
  Loop
    Fetch C1 into patient_rec;
    Exit when C1%NotFound;
    DBMS_ OUTPUT.PUT_LINE(patient_rec. P_no ||
patient_rec.Patient_name||patient_rec.Dt_birth)
    Total := Total + patient_rec.Consultation_fee
  End loop
  Close C1;
DBMS_OUTPUT.PUT_LINE (Total);
End;
```

OR

```
Declare
  Cursor  C1 is Select * from hospital where Department ='Surgery';
  Total Number: = 0;
  Begin
    For patient_rec in C1 loop
        DBMS_ OUTPUT.PUT_LINE(patient_rec.P_no ||
patient_rec.Patient_name|| patient_rec.Dt_birth)
        Total := Total + patient_rec.consultation_fee
    End loop
    DBMS_OUTPUT.PUT_LINE (Total);
End;
```

OR

Any other equivalent code

(1 Mark for declaring the cursor)
(1/2 Mark for correct loop)
(1/2 Mark for fetching)
(1/2 Mark for correct output)
(1/2 Mark for calculation of consultation fee)

COMPUTER   SCIENCE

Time allowed : 3 hours   *Maximum Marks : 70*

Instructions :

(i)   **All** *questions are compulsory.*

(ii)   *Programming Language : C++*

QUESTION PAPER CODE 91/1

1.   (a)   Name the header file to which the following belong   1

(i) **abs( )**   (ii) **isupper( )**

(b)   Illustrate the use of **#define** in C++ to define a macro.   2

(c)   Rewrite the following program after removing the syntactical error(s), if
any. Underline each correction.   2

```
#include<iostream.h>
void main( )
{      struct  STUDENT
       {      char stu_name[20];
              char stu_sex;
              int stu_age=17;
       } student;
       gets(stu_name);
       gets(stu_sex);
}
```

(d)   Find the output of the following program :   3

```
#include<iostream.h>
#include<string.h>
class state
{      char *state_name;
       int size;
       public:
       state( ); { size=0; state_name=new char[size+1];      }
       state(char *s)
```

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```
{    size = strlen(s) ; state_name = new char[size+1];
     strcpy(state_name,s);
}
void display( ) {cout<<state_name<<endl;}
void Replace (state & a, state & b)
{    size = a.size + b.size;
     delete state_name;
     state_name = new char[size+l];
     strcpy(state_name, a.state_name);
     strcat(state_name, b.state_name);
}
};
void main( )
{    char * temp = "Delhi";
     state state1 (temp), state2("Mumbai"), state3("Nagpur"), S1, S2;
     S1.Replace(state1, state2);
     S2. Replace(S1, state3);
     S1.display( );
     S2.display( );
}
```

(e) Find the output of the following program :   2

```
#include<iostream.h>
void main( )
     {    long NUM= 1234543;
          int F=0, S=0;
     do
     {    int Rem = NUM% 10 ;
          if (Rem % 2 !=0)
               F+=R;
          else
               S+=R;
          NUM /=10;
     }while(NUM>0);
     cout<<F-S;

}
```

(f) What are Nested Structures ? Give an example.   2

2. (a) Define Multilevel and Multiple inheritance in context of Object Oriented Programming. Give suitable example to illustrate the same. 2

(b) Answer the questions (i) and (ii) after going through the following class :

```
class Interview
{    int month;
     public:
     Interview(int y)              {month=y;}     //Constructor 1
     Interview(Interview&t);              //Constructor 2
};
```

   (i)   Create an object, such that it invokes Constructor 1 1
   (ii) Write complete definition for Constructor 2 1

(c) Define a class named ADMISSION in C++ with the following descriptions : 4

   Private members :

   AD_NO   integer (Ranges 10 - 2000)
   NAME   Array of characters(String)
   CLASS   Character
   FEES   Float

   Public Members :

   • Function Read_Data( ) to read an object of ADMISSION type
   • Function Display( ) to display the details of an object
   • Function Draw-Nos( ) to choose 2 students randomly.
     And display the details. Use random function to generate admission
     nos. to match with AD_NO.

(d) Answer the questions (i) to (iii) based on the following code :

```
class stationary
{
     char Type;
     char Manufacturer[10];
     public:
     stationary( );
     void Read_sta_details( );
     void Disp_sta_details( );
};
class office : public stationary
{
```

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```
        int no_of_types;
        float cost_of_sta;
        public:
        void Read_off_details( );
        void Disp_off_details( );
    };
    class printer : private office
    {
        int no_of_users;
        char delivery _date [10];
        public:
        void Read_pri_details( );
        void Disp_pri_details( );
    };
    void main( )
    {    printer MyPrinter;      }
```

(i)   Mention the member names which are accessible by MyPrinter declared in main( ) function   1

(ii)   What is the size of MyPrinter in bytes ?   1

(iii)   Mention the names of functions accessible from the member function Read_pri_details( ) of class printer.   2

3.   (a)   Write a function in C++ which accepts an integer array and its size as arguments/parameters and assign the elements into a two dimensional array of integers in the following format

If the array is **1, 2, 3, 4, 5, 6**	If the array is **1, 2, 3**	3

The resultant 2 D array is given below	The resultant 2 D array is given below

1	2	3	4	5	6
1	2	3	4	5	0
1	2	3	4	0	0
1	2	3	0	0	0
1	2	0	0	0	0
1	0	0	0	0	0

1	2	3
1	2	0
1	0	0

(b) An array MAT[30][10] is stored in the memory column wise with each element occupying 8 bytes of memory. Find out the base address and the address of element MAT[20][5], if the location of MAT[5][7] is stored at the address 1000.   4

(c) class queue   4
{ int data[10];
        int front, rear;
        public:
        queue( ) {front = -1; rear=-1;}
    voidadd();   // to add an element into the queue
    void remove();   // to remove an element from the queue
    void Delete(int ITEM);   // To delete all elements which are equal
                                            to ITEM
    };

Complete the class with all function definitions for a circular array Queue. Use another queue to transfer data temporarily

(d) Write a function in C++ to perform Push operation on a dynamically allocated stack containing real number.   3

(e) Write the equivalent infix expression for
    a, b, AND, a, c, AND, OR   2

4.   (a) void main()
        {   char ch='A';
               fstream fileout("data.dat",ios::out);
               fileout<<ch;
               int p = fileout.tellg();
               cout<<p;

What is the output if the file content before the execution of the program is the string **"ABC" (Note that " " are not part of the file)**

(b) Write a function to count the number of words present in a text file named "PARA.TXT". Assume that each word is separated by a single blank/space character and no blanks/spaces in the beginning and end of the file.   2

(c) Following is the structure of each record in a data file named "COLONY.DAT".   3

struct   COLONY
{   char Colony_Code[10];
           char Colony_Name[10];
           int No_of_People;
};

Write a function in C++ to update the file with a new value of No_of_People. The value of Colony_Code and No_of_People are read during the execution of the program.

5.   (a)   What is an Alternate Key ?   2

(b)   Study the following tables DOCTOR and SALARY and write SQL commands for the questions (i) to (iv) and give outputs for SQL queries (v) to (vi):   6

TABLE : DOCTOR

ID	NAME	DEPT	SEX	EXPERIENCE
101	John	ENT	M	12
104	Smith	ORTHOPEDIC	M	5
107	George	CARDIOLOGY	M	10
114	Lara	SKIN	F	3
109	K George	MEDICINE	F	9
105	Johnson	ORTHOPEDIC	M	10
117	Lucy	ENT	F	3
111	Bill	MEDICINE	F	12
130	Morphy	ORTHOPEDIC	M	15

TABLE : SALARY

ID	BASIC	ALLOWANCE	CONSULTATION
101	12000	1000	300
104	23000	2300	500
107	32000	4000	500
114	12000	5200	100
109	42000	1700	200
105	18900	1690	300
130	21700	2600	300

(i)   Display NAME of all doctors who are in "MEDICINE" having more than 10 years experience from the table DOCTOR.

(ii)   Display the average salary of all doctors working in "ENT" department using the tables DOCTOR and SALARY. Salary = BASIC + ALLOWANCE

(iii) Display the minimum ALLOWANCE of female doctors,

(iv) Display the highest consultation fee among all male doctors,

(v)   SELECT count(*) from DOCTOR where SEX = "F"

(vi) SELECT NAME, DEPT, BASIC from DOCTOR, SALARY
      where DEPT = "ENT" and DOCTOR.ID = SALARY.ID

6.   (a)   State and verify Distributive Law.   2

      (b)   Write the equivalent expression for the following Logical Circuit :   2

      (c)   Express P + Q'R in canonical SOP form.   1

      (d)   Reduce the following Boolean expression using K-Map.
            $F(P, Q, R, S) = \Sigma (0, 3, 5, 6, 7, 11, 12, 15)$ 3

7.   (a)   Differentiate between Internet and Intranet.   1

      (b)   Expand the following terms
            (i) CDMA   (ii) URL   (iii) HTTP   (iv) WAN   2

      (c)   Write one advantage of STAR topology as compared toTBUS topology.   1

      (d)   UNIVERSITY OF CORRESPONDENCE in Allahabad is setting up the network between its different wings. There.are 4 wings named as Science (S), Journalism (J), ARTS (A) and Home Science(H).

Distance between various wings are given below

Wing A to Wing S	100 m
Wing A to Wing J	200 m
Wing A to Wing H	400 m
Wing S to Wing J	300 m
Wing S to Wing H	100 m
Wing J to Wing H	450 m

Number of Computers

Wing A	150
Wirig S	10
Wing J	5
Wing H	50

(i) Suggest a suitable Topology for networking the computer of all wings 1

(ii) Name the wing where the Server to be installed. Justify your answer, 1

(iii) Suggest the placement of Hub/Switch in the network. 1

(iv) Mention an economic technology to provide internet accessibility to all wings. 1

QUESTION PAPER CODE 91

1. (a) **Name the** header file to which the following belong : 1
   (i) pow()
   (ii) random()

   (b) Illustrate the use of inline function in C++ with the help of an example. 2

   (c) Rewrite the following program after removing the syntactical error(s), if any. Underline each correction. 2

   ```
   #include <idstream.h>
   void main()
   {     struct movie
         {     char movie_name[20];
               char movie_type;
               int ticket_cost = 100;
   ```

```
        }MOVIE;
        gets(movie_name);
        gets(movie_type);
    }
```

(d) Find the output of the following program :   3

```cpp
#include<iostream.h>
#include<string.h>
class student
{    char *name;
     int l;
     public:
     student() { l=0; name=new char[l+1];    }
     student(char *s)
     {    l=strlen(s); name=new char[l+1];
          strcpy (name,s);
     }
     void display() { cout<<name<<endl;}
     void manipulate(student & a, student & b)
     {    l=a.l + b.l;
          delete name;
          name=new char[l+l];
          strcpy(name, a.name);
          strcat(name, b.name);
     }
};
void main()
{    char * temp ="Jack";
     student name1(temp), name2("Jill"), name3("John"),S1,S2;
     S1.manipulate(name1,name2);
     S2.manipulate(S1,name3);
     S1.display();
     S2.display();
}
```

(e) Find the output of the following program :   2

```
#include<iostream.h>
void main()
{     long Number = 7583241;
      int First=0, Second=0;
      do
      {     int R = Number%10;
            if(R%2==0)
                  First+=R;
            else
                  Second+=R;
            Number /=10;
      }while(Number>0);
      cout<<First-Second;
}
```

(f) What is a default constructor ? How does it differ from destructor ?   2

2. (a) What is "this" pointer ? Give an example to illustrate the use of it in C++.   2

(b) Answer the questions (i) and (ii) after going through the following class :

```
class Exam
{     int year;
      public:
      Exam(int y) { year=y;}     //Constructor 1
      Exam(Exam & t);            //Constructor 2
};
```

(i) Create an object, such that it invokes Constructor 1.   1

(ii) Write complete definition for Constructor 2.   1

(c) Define a class named HOUSING in C++ with the following descriptions :   4
     Private members

REG_NO	integer(Ranges 10 - 1000)
NAME	Array of characters(String)
TYPE	Character
COST	Float

273

Public Members

- Function Read_Data() to read an object of HOUSING type
- Function Display() to display the details of an object
- Function Draw_Nos()to choose and display the details of 2 houses selected randomly from an array of 10 objects of type HOUSING. Use random function to generate the registration nos. to match with REG_NO from the array.

(d) Answer the questions (i) to (iii) based on the following code :

```
class furniture
{
    char Type;
    char Model[10];
    public:
    furniture();
    void Read_fur_details();
    void Disp_fur_details();
};
class sofa : public furniture
{
    int no_of_seats;
    float cost_of_sofa;
    public:
    void Read_sofa_details();
    void Disp_sofa_details();
};
    class office : private sofa
    {
    int no_of_pieces;
    char delivery_date[10];
    public:
    void Read_office_details();
    void Disp_office_details();
    };
void main()
{   office MyFumiture;  }
```

(i) Mention the member names which are accessible by MyFurniture declared in main() function.   1

(ii) What is the size of MyFurniture in bytes ?   1

(iii) Mention the names of functions accessible from the member function Read_office_details() of class office.   2

3. (a) Write a function in C++ which accepts an integer array and its size as arguments/parameters and assign the elements into a two dimensional array of integers in the following format :   3

If the array is **1, 2, 3, 4, 5, 6**   If the array is **1, 2, 3**

The resultant 2 D array is given below   The resultant 2 D array is given below

1	0	0	0	0	0		1	0	0
1	2	0	0	0	0		1	2	0
1	2	3	0	0	0		1	2	3
1	2	3	4	0	0				
1	2	3	4	5	0				
1	2	3	4	5	6				

(b) An array MAT[20][10] is stored in the memory along the row with each element occupying 4 bytes of memory. Find out the base address and the address of element MAT[10][5], if the location of MAT[3][7] is stored at the address 1000.   4

(c) Introduction class stack
```
{   int data[10];
    int top;
    public:
    stack() {top=-l)
    void push(); // to push an element into the stack
    void pop(); // to pop an element from the stack

    void Delete(int ITEM); // To delete all elements which are equal to ITEM
};
```
Complete the class with all function definitions. Use another stack to transfer data temporarily.   4

(d) Write a function in C++ to perform Insert operation in dynamically allocated Queue containing names of students.   3

(e) Write the equivalent infix expression for   2

     10, 3, *, 7, 1, -, *, 23, +

4. (a) void main( )

```
{      char ch='A';
       fstream fileout("data.dat", ios::app);
       fileout<<ch;
       int p=fileout.tellg( );
       cout<<p;
}
```

What is the output if the file content before the execution of the program is the string?

"ABC" (Note that """are not part of the file)   1

(b) Write a function to count the number of blanks present in a text file named "PARA.TXT.   2

(c) Following is the structure of each record in a data file named PRODUCT.DAT".
struct PRODUCT

```
{      char Product_Code[10];
       char Product_Description[10];
       int Stock;
};
```

Write a function in C++ to update the file with a new value of Stock. The Stock and the Product_Code, whose Stock to be updated, are read during the execution of the program.   3

5. (a) What are DDL and DML ?   2

(b) Study the following tables FLIGHTS and FARES and write SQL commands for the questions (i) to (iv) and give outputs for SQL queries (v) to (vi).

TABLE : FLIGHTS

FL_NO	STARTING	ENDING	NO_FLIGHTS	NO_STOPS
IC301	MUMBAI	DELHI	8	0
IC799	BANGALORE	DELHI	2	1
MC101	INDORE	MUMBAI	3	0
IC302	DELHI	MUMBAI	8	0
AM812	KANPUR	BANGALORE	3	1
IC899	MUMBAI	KOCHI	1	4
AM501	DELHI	TRIVANDRUM	1	5
MU499	MUMBAI	MADRAS	3	3
IC701	DELHI	AHMEDABAD	4	0

TABLE : FARES

FL_NO	AIRLINES	FARE	TAX%
IC701	Indian Airlines	6500	10
MU499	Sahara	9400	5
AM501	Jet Airways	13450	8
IC899	Indian Airlines	8300	4
IC302	Indian Airlines	4300	10
IC799	Indian Airlines	10500	10
MC101	Deccan Airlines	3500	4

(i) Display FL_NO and NO_FLIGHTS from "KANPUR" to "BANGALORE" from the table FLIGHTS.

(ii) Arrange the contents of the table FLIGHTS in the ascending order of FL_NO.

(iii) Display the FL_NO and fare to be paid for the flights from DELHI to MUMBAI using the tables FLIGHTS and FARES, where the fare to be paid=FARE+FARE*TAX%/100.

(iv) Display the minimum fare "Indian Airlines" is offering from the table FARES.

(v) SELECT FL_NO, NO_FLIGHTS, AIRLINES from FLIGHTS, FARES where STARTING="DELHI" and FLIGHTS.FL_NO=FARES.FL_NO.

(vi) SELECT count(distinct ENDING) from FLIGHTS.

6. (a) State and verify Associative Law. 2

(b) Write the equivalent expression for the following logical circuit : 2
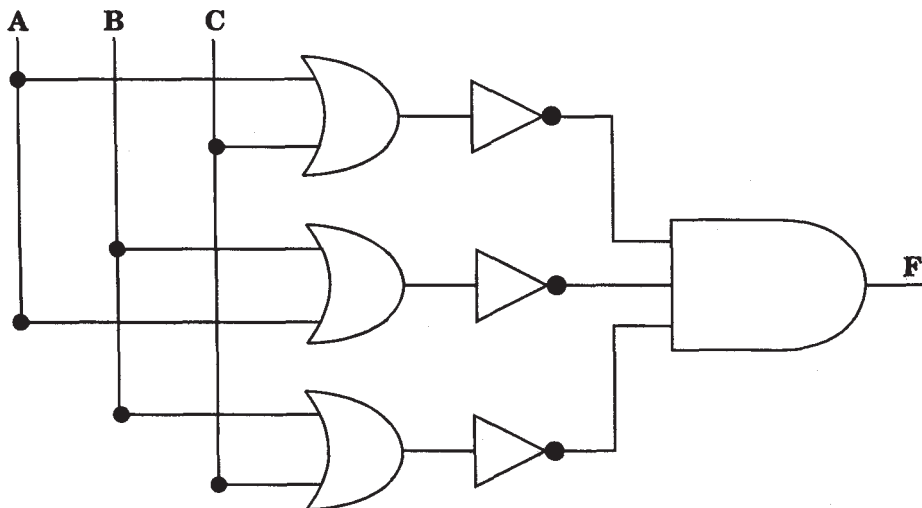
(c) Express P + Q'R in POS form.   1

(d) Reduce the following Boolean expression using K-Map :   3
F(P, Q, R, S) =   (0, 3, 5, 6, 7, 11, 12, 15)

7.   (a) Name two transmission media for networking.   1

(b) Expand the following terms :   1
    (i) XML
    (ii) GSM
    (iii) SMS
    (iv) MAN

(c) Differentiate between Hackers and Crackers.

(d) INDIAN PUBLIC SCHOOL in Darjeeling is setting up the network between its different wings. There are 4 wings named as SENIOR(S), JUNIOR(J), ADMIN(A) and HOSTELCH).

Distance between various wings are given below :

Wing A to Wing S	100 m
Wing A to Wing J	200 m
Wing A to Wing H	400 m π
Wing S to Wing J	300 m
Wing S to Wing H	100 m
Wing J to Wing H	450 m

Number of Computers

Wing A	10
Wing S	200
Wing J	100
Wing H	50

    (i) Suggest a suitable Topology for networking the computer of all wings.   1
    (ii) Name the wing where the Server is to be installed. Justify your answer.   1
    (iii) Suggest the placement of Hub/Switch in the network.   1
    (iv) Mention an economic technology to provide internet accessibility to all wings.   1

Marking Scheme — Computer Science

QUESTION PAPER CODE 91/1

EXPECTED ANSWERS/VALUE POINTS

1. (a) (i) math.h   (ii) ctype.h

   (½ Marks for each correct Header File)

   (b) #define is a preprocessor directive that is used to define a symbolic constant. The symbolic constant defined, replaces the word / statement wherever it appears in the program as a macro substitution.

   Syntax :   #define symbolic_name value

   Example: #define Pi 3.14

   #define WELCOME cout<<"Hello World !\n";

   (Full 2 marks for illustrating the concept of #define using example)

   OR

   (1 mark if only definition is written)

   (c) Corrected Program:
   ```
   #include<iostream.h>
   #include<stdio.h>        // Error 1
   void main()
   {   struct STUDENT
       {   char  stu_name[20];
           char  stu_sex;
           int  stu_age;     //Error 2
   ```

```
      } student;
      gets(student.stu_name);    //Error 3
      cin>>student.stu_sex;      //Error 4
      student.stu_age = 17;      //Ignored
}
```

(½ mark each for removing four errors)

OR

(1 Mark to be given for only identification of all the errors without rectification)

Note: If student replaces gets by cin>> or cin.getline( )and does not mention <stdio.h> then full marks to be given if other errors are corrected.

(d)   DelhiMumbai

DelhiMumbaiNagpur

(3 full marks for identifying error in definition of the constructor state() in Line 7)

OR

(3 marks for the correct lines of output)

OR

(2 marks for <u>any one</u> correct line of output)

OR

(1 Mark for showing the output starting with Delhi)

(e)   2   (assuming R as Rem)

(2 marks for correct output as 2)

OR

(2 marks for identifying error as R is not declared)

OR

(Full 2 marks to be awarded to the students who have scored at least 1 mark in the entire Q. No. 1 i.e. from 1(a) to 1(f))

(f)   —

Note: Students are exposed to the concept of "Structures" and "Nested Loops", but not exposed specifically to the concept of "Nested structures". So benefit of doubt should be given to the students.

(2 marks for correct definition or example)

OR

(Full 2 marks to be awarded to the students who have scored at least 1 mark in the entire Q. No. 1 i.e. from 1(a) to 1(f))

2.   (a) In Multilevel inheritance, a class inherits it's properties from another derived class transitively.

```
┌───┐
│ A │
└───┘
  ↓
┌───┐
│ B │
└───┘
  ↓
┌───┐
│ C │
└───┘
```
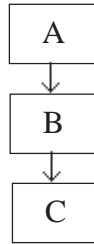
In **Multiple inheritance**, a derived class inherits from multiple base classes.

```
┌───┐        ┌───┐
│ A │        │ B │
└───┘        └───┘
    ↘      ↙
      ┌───┐
      │ C │
      └───┘
```
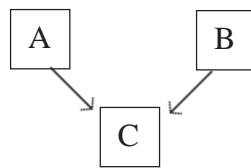
(1/2 mark each for any correct definition)

(1/2 mark each for any correct example – diagrammatic/C++ representation)

OR

(Full 2 marks for explaining the 2 types of inheritance with the help of suitable examples or diagram)

(b)   `Interview  Ob1(5);`

    OR

    `int  N=5;  Interview  Ob1(N);`

    (1 mark for proper declaration of Object)

```
Interview(Interview  &t)
{
    month = t.month;
}
```

(1 mark for writing proper statements inside definition of Constructor 2)

OR

(1 mark for writing the conceptual definition of the copy constructor)

OR

(Only ½ mark for mentioning the term: copy constructor)

Note: Any valid statement in C++ working with t as an object of Interview must be accepted while defining the constructor.

(c) ```cpp
class ADMISSION
{
        int AD_NO;
        char NAME[20]; //or any constant size
        char CLASS;
        float FEES;

        public:
        void Read_Data()
    {
        do
        {
            cin>>AD_NO;
        }while (AD_NO<10 || AD_NO>2000);
        gets(NAME);
            cin>>CLASS;
        cin>>FEES;
    }
    void Display()
    {
        cout<<AD_NO;
        cout<<NAME;
        cout<<CLASS;
        cout<<FEES;
    }
    void Draw_Nos();
};
```

(1 mark for proper syntax of class definition with correct class name and a semicolon to end the class definition)
(1 mark for proper declaration of private members)
(1 mark for proper definition of Read_Data())
(1 mark for proper definition of Display())

Note: No marks should be deducted for
*   Not checking the range for AD_NO*
*   Not declaring or defining Draw_Nos(). (Mentioned as Draw-Nos() in the question paper)*

(d) (i) Read_pri_details(), Disp_pri_details()

(1 mark for correct function names)

(ii) 29 bytes

OR

33 bytes

(1 mark for correct answer)

(iii) Disp_pri_details(), Read_off_details(), Disp_off_details(), Read_sta_details(), Disp_sta_details()

(2 marks for all correct member functions)

Note:

No partial marks to be given for any of the parts.
Ignore the constructor and function itself

3. (a)
```
const int R = 100, C = 100;
void Arrayconvert(int A1D[], int N)
{
    int  A2D[R][C]={0};
    for(int I = 0; I<N; I++)
        for (int J = 0; J <N-I; J++)
            A2D[I][J]  = A1D[J];
}
```

OR

```
const int R = 100, C = 100;
void Arrayconvert(int A1D[], int N)
{
    int  A2D[R][C];
    for(int I = 0; I<N; I++)
        for (int J = 0; J <N; J++)
        if (J<N-I)
            A2D[I][J]  = A1D[J];
        else
            A2D[I][J]  = 0;
}
```

OR

```
const int R = 100, C = 100;
void Arrayconvert(int A1D[], int N)
{
    int A2D[R][C], I, J;
    for(I = 0; I<N; I++)
        for (J = 0; J <N; J++)
            A2D[I][J] = 0;
    for(I = 0; I<N; I++)
        for (J = 0; J <N-I; J++)
            A2D[I][J] = A1D[J];
}
```

OR

Any other equivalent code

(1 mark for function header)
(1 mark for correct use of nested loops)
(½ mark for correctly assigning the values from 1D array to 2D array)
(½ mark for assigning 0 to the rest of the elements)
Note: Ignore declaration of the 2D array.

(b) For Column wise allocation

Address of A[I][J] = BA + W[(J –LBC) x M + (I - LBR)]

Where

BA = Base Address

W = Size of each element in bytes = 8 bytes (given)

M = No. of rows in the 2D Array = 30 (given)

Address of MAT[5][7] given is 1000.

Assumption 1 : LBR=LBC=0

Therefore

$$1000 = BA + 8 (7 \times 30 + 5)$$
$$= BA + 8 \times 215$$
$$= BA + 1720$$
$$BA = 1000 - 1720$$
$$= -720$$

Therefore,

Base Address = - 720

Thus, Address of MAT[20][5] = -720 + 8 (5 × 30 + 20)
$$= -720 + 8 \times 170$$
$$= -720 + 1360$$
$$= 640$$

Therefore

$$1000 = BA + 8\,[(7\text{-}1) \times 30 + (5\text{-}1)]$$
$$= BA + 8[6 \times 30 + 4]$$
$$= BA + 8 \times 184$$
$$= BA + 1472$$

$$BA = 1000 - 1472$$
$$= \text{-}472$$

Therefore,

Base Address $= -472$

Thus, Address of MAT[20][5] $= \text{-}472 + 8\,(4 \times 30 + 19)$
$$= \text{-}472 + 8 \times 139$$
$$= \text{-}472 + 1112$$
$$= 640$$

(2 marks for writing the correct column major formula or sustitution of values in the correct formula)
(1 mark for calculating Base Address)
(1 mark for calculating final address of MAT[20][5])

(c)
```
void queue::add( )
{
    if ( (rear + 1) % 10 != front )
    {
        if (rear == -1 )
            front = rear = 0 ;
        else
            rear = (rear + 1) %10;
        cin>>data[rear];
    }
    else
        cout<<"Queue full !! Overflow Error !!\n";
}
void queue::remove()
{
    if (front != -1)
    {
        cout<< data[front]<<" deleted ";
        if(front==rear)
            front=rear=-1;
        else
            front = (front+1)%10;
    }
    else
        cout<<"Queue empty ! Underflow Error!!\n";
}
```

OR

```
void queue::add( )
{
    if ( (rear + 1) % 10 != front )//Ignoring -1
initial values
    {
        rear = (rear + 1) %10;
        cin>>data[rear];
    }
    else
        cout<<"Queue full !! Overflow Error !!\n";
}
void queue::remove()
{
    if (front != rear) //Ignoring -1 initial values
    {
        front = (front+1)%10;
        cout<< data[front]<<" deleted…";
    }
    else
        cout<<"Queue empty ! Underflow Error!!\n";
}
```

OR

```
void queue::add()
{   int item;
    if((front==0 && rear==9) || front==rear+1)
        cout<<"\nQueue overflow error";
    else
    {
        cout<<"\nEnter an item to add : ";
        cin>>item;
        if(front==-1)
        {    front=0;rear=0;  }
        else
            rear=rear+1;
        if(rear==10)
            rear=0;
        data[rear]=item;
    }
}
```

```
void queue::remove()
{   if((front==-1 )
        cout<<"\nQueue Underflow Error";
    else
    {   int item=data[front];
        if(front==rear)
                front=rear=-1;
        else if(front==9)
                front=0;
            else
                front=front+1;
    cout<<"\nDeleted item is : "<<item;
    }
}
```

OR

Any other equivalent code

(2 marks for any correct add( )function code)
(½ mark for checking Overflow condition)
(1 mark for changing the values of rear counter)
(½ mark for assigning the new value at the correct position)
(2 marks for any correct remove( )function code)
(1 mark for checking Underflow condition)
(1 mark for changing the values of front counter)

Note: There is a conceptual contradiction for the function void Delete(int ITEM) , thus the benefit of doubt is given to the student and therefore the definition of the function is to be ignored .

(d)
```
struct Node
{
    float Data;Node *Link;
};
class Stack
{
    Node *Top;
public:
    Stack() { Top = NULL ; }
    void Push( );void Pop ( );void Display ( );
};
```

```
void Stack::Push()
{
    Node *Temp = new Node;
    cin>>Temp->Data;
    Temp->Link = Top;
    Top = Temp;
}
```
OR

Any other code demonstrating proper Push( ) for a dynamic stack.

(½ mark for creating new node dynamically)
(½ mark for assigning a real number to the info part)
(1   mark for linking new node to the Top of the Stack)
(1 mark for assigning the new value to the Top)

(e)

S.No.	Element scanned	Operation	Infix Expression
1	A	Push a	a
2	B	Push b	a, b
3	AND	Pop, Pop, Push (a AND b)	a AND b
4	A	Push a	a AND b, a
5	C	Push c	a AND b, a, c
6	AND	Pop, Pop, Push(aANDc)	a AND b, a AND c
7	OR	Pop, Pop, a AND b OR a AND c	Push (a AND b OR a AND c

Ans: a AND b OR a AND c

(2 marks for writing correct expression)
OR
(2 full marks if any other part of Q3 is correctly attempted as students are familiar with infix to postfix conversion only)

4.   (a)   1

(1 mark for correct output)
OR
(Full 1 mark if error is mentioned due to usage of tellg( ) with out mode as the students generally associate tellg( ) with only ios::in mode)
OR
(Full 1 mark if student gets at least 1 Mark in any part of question 4)

(b)
```
void countwords( )
{
    ifstream fin;
    fin.open("Para.txt");
    char ch ;
    int count = 1;
    while(!fin.eof())
    {
        ch = fin.get();
        if (ch == ' ')
                count ++;
    }
    cout<<"\nNumber of words = "<<count; // Optional
    fin.close();                    //Optional
}
```

OR

```
void countwords( )
{
    ifstream fin"Para.txt");
    char str[30] ;
    int count = 0;
    while(fin)
    {
        fin>>str;
        count++;
    }
    cout<<"\nNumber of words = "<<count; // Optional
    fin.close();                    //Optional
}
```

OR

```
void countwords( )
{
    fstream fin;
    fin.open("Para.txt", ios::in);
    char ch[80] ;
    int count = 1;
    while(fin)
    {
```

```
        fin.getline(str,80);
        for(int  i=0;str[i]!='\0';i++)
            if (ch == ' ')
                count++;
    }
cout<<"\nNumber of words = "<<count; // Optional
fin.close();                        //Optional
}
```

OR

```
void countwords( )
{
    fstream fin("Para.txt", ios::in);
    char ch[80] ;
    int count = 0;
    while(fin)
    {
        fin.getline(str,80, ' ');
        count++;
    }
cout<<"\nNumber of words = "<<count; // Optional
fin.close();                  //Optional
}
```

OR

Any other equivalent code

(1/2 mark for opening file in correct mode either using ifstream or ios::in)
(1/2 mark for correct loop)
(1/2 mark for checking for blank space/equivalent code)
(1/2 mark for counting number of words)

(c)
```
void update()
{
    fstream f;
    COLONY c;
    char C_Code[10];
    cout<<"\nEnter the Colony Code : ";
    cin>>C_Code;        // OR gets(C_Code);
    f.open("COLONY.DAT",ios::binary|ios::in|ios::out);
    while(f.read((char*)&c,sizeof(COLONY)))
    {
        if(strcmp(c.Colony_Code,  C_Code)==0)
```

```
            {
                  cout<<"\nEnter the new Number of people : ";
                  cin>>c.No_of_People;
                  f.seekp(f.tellg()- sizeof(c));
                  //OR f.seekp(f.tellg()- sizeof(c), ios::beg);
                  //OR f.seekp(- sizeof(c), ios::curr);
                  f.write((char*)&c, sizeof(COLONY));
            }
        }
        f.close();
}
```

OR

Any other equivalent code

(½ mark for reading Colony_ Code and No_of_People)
(1 mark for opening the file(s) in correct mode)
(½ mark for correct loop)
(1 mark for read function)

Note: Since search condition is not clearly mentioned in the question, search and updation to be ignored

5.   (a)   Candidate key(s), which is not selected as Primary Key, is known as Alternate key(s).

   (2 marks for any equivalent correct definition)

   (b)   (i)   SELECT NAME FROM DOCTOR
            WHERE DEPT = 'MEDICINE' AND EXPERIENCE >10;

         (½ mark for correct Select statement)
         (½ mark for correct Where clause)

         (ii)   SELECT AVERAGE(S.BASIC + S.ALLOWANCE)
            FROM DOCTOR D, SALARY S
            WHERE D.DEPT = 'ENT' AND D.ID = S.ID;

            OR

            SELECT AVERAGE(BASIC + ALLOWANCE)
            FROM DOCTOR, SALARY
            WHERE DEPT = 'ENT' AND DOCTOR.ID = SALARY.ID;

            (1/2 mark for correct Select statement)
            (1/2 mark for correct Where clause)
            OR
            (1 mark for students who have correctly attempted any two parts of Q5b)

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(iii) SELECT MIN(S.ALLOWANCE)

FROM DOCTOR D, SALARY S

WHERE D.SEX = 'F' AND D.ID = S.ID;

OR

SELECT MIN(ALLOWANCE)

FROM DOCTOR, SALARY

WHERE SEX = 'F' AND DOCTOR.ID = SALARY.ID;

(½ mark for correct Select statement)

(½ mark for correct Where clause)

(iv) SELECT MAX(S.CONSULTATION)

FROM DOCTOR D, SALARY S

WHERE D.SEX = 'M' AND D.ID = S.ID;

OR

SELECT MAX(CONSULTATION)

FROM DOCTOR , SALARY

WHERE SEX = 'M' AND DOCTOR.ID = SALARY.ID;

(1/2 mark for correct Select statement)

(1/2 mark for correct Where clause)

(v) 4

(1 mark for correct answer)

(vi)

NAME	DEPT	BASIC
John	ENT	12000

(1 mark for correct answer)

6.   (a)   Distributive Laws are :

(a) $A (B + C) = A B + A C$

(b) $A + (B C) = (A + B) (A + C)$

Verification of first distributive law using truth table:

A	B	C	B+C	A(B+C)	AB	AC	AB+AC
0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0
0	1	0	1	0	0	0	0
0	1	1	1	0	0	0	0
1	0	0	0	0	0	0	0
1	0	1	1	1	0	1	1
1	1	0	1	1	1	0	1
1	1	1	1	1	1	1	1

Comparing Column Numbers 5 and 8, Distributive law is verified.

(1 Mark for writing either of the distributive law)
(1 Mark for verification using truth table)

(b)

(2 Marks for correct expression)
OR
(½ Mark each for (AC)', (AB)',(BC)' and the final expression)

(c) $(P + Q'R)$

$= P (Q+Q')(R+R') + Q'R(P+P')$

$= (PQ +PQ') (R + R') + PQ'R + P'Q'R$

$= PQR + PQ'R + PQR' + PQ'R' + PQ'R + P'Q'R$

$= PQR + PQ'R + PQR' + PQ'R' + P'Q'R$

(1 mark for the canonical expression)

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(d)

	P'O'	P'O	PO	PO'
R'S'	①		①	
R'S		1		
RS	1	1	1	1
RS'		1		

OR

	R'S'	R'S	RS	RS'
P'O'	①		1	
P'O		1	1	1
PO	①		1	
PO'			1	

F= RS + P'QS + P'QR + P'Q'R'S' + PQR'S'

(1 Mark for correct placing of 1s)
(1 Mark for correct grouping)
(1 Mark for final reduced expression)

7. (a) Internet is a network of computer networks which operates world-wide using a common set of communications protocols.

Intranet is an inter-connected network within one organization that uses Web technologies for the sharing of information internally.

(Full 1 Mark for correctly defining internet only as Intranet is not directly specified in the syllabus)

(b) (i) Code Divison Multiple Access

(ii) Uniform Resource Locator (Location) / Universal Resource Locator (Location)

(iii) Hype Text Transfer (Transmission) Protocol

(iv) Wide Area Network

(½ mark for each term)

(c) Fault detection is easy.

Fault isolation is easy.

OR

Any other valid advantage.

(1 mark for any one correct advantage)

(d) (i) Star or Bus or any other valid topology or diagram.
   (1 mark for mentioning any of the above topologies)
   (1 mark for diagrammatic representation of any of the above topologies)

   (ii) Wing A, because maximum number of computers are located at Wing A.
   (1 mark for the correct answer)
   OR
   (½ mark if only Wing A is mentioned without justification)

   (ii) Hub/Switch in all the wings.
   OR
   Correct diagram depicting placement of Hub/Switch in all the wings.
   (1 mark for correct placement)

   (iv) Coaxial cable / Modem / LAN / TCP-IP / Dialup/ DSL/ Leased Line
   OR any other valid technology (any one).

   Note: Optical fiber, Satellite link and Microwave NOT to be considered as valid answers.
   (1 Mark for any valid technology)

EXPECTED ANSWERS/VALUE POINTS

1. (a) (i) math.h / complex.h   (ii) stdlib.h
    (1/2 Marks for each correct Header File)

    (b) —
    Note: As the term inline function is not mentioned in the curriculum, benefit of doubt should be given to the students.
    (Full 2 marks to be awarded to the students who have scored at least 1 mark in the entire Q. No. 1 i.e. from 1(a) to 1(f))

    (c)
```
#include<iostream.h>
#include<stdio.h> // Error 1 - needed for gets()
void main()
{
    struct movie
    {
        char movie_name[20];
        char movie_type;
        int ticket_cost = 100; //Error 2 - assignment not
                //possible inside structure definition
    }MOVIE;
```

```
        gets(MOVIE.movie_name);//Error 3 -members must be
                              //accessed using object
        cin>>MOVIE.movie_type; //Error 4 -cant use gets for
                              //char variable and member must
                              //be accessed using object.
}
#include<iostream.h>
void main()
{
    struct movie
    {
        char movie_name[20];
        char movie_type;
        int ticket_cost = 100; //Error 1 - initialization` not
                //possible inside structure definition
    }MOVIE;
    cin.getline(MOVIE.movie_name,20);//Error 2 -members must
                    //be accessed using object
    cin>>MOVIE.movie_type;   //Error 3 -cant use gets for
                              //char variable and member must
                              //be accessed using object.
}
```

(1 mark for identifying and correcting any one Error)
(1 ½ mark for identifying and correcting any two errors)
(2 marks for identifying and correcting more than two errors)

OR

(1 mark for only identifying all errors)

(d) JackJill
     JackJillJohn

(2 marks for any one correct line)
(Full 3 marks for both lines correct)
(½ mark to be deducted from full 3 marks, if endl is not considered)

(e) -2
     (**Full 2 marks for correct output**)
     OR
     (**Full 2 marks for mentioning values of First as 14 and Second as 16,
     as representation of minus sign is not very prominent**)
     OR
     (**Full 2 marks for mentioning syntax error with justification as
     insertion operator << expected in between First and Second**)

(f) A constructor that accepts no parameters is called the default constructor. The compiler supplies a default constructor, if a class has no explicit constructor defined. It initializes the data members by a dummy value. It is also used to create objects with default values.

Destructor is used to destroy the objects and deallocate the memory resources that have been allocated by a constructor. It has same name as the class preceded by tilde (~). It takes no arguments and no return types can be specified.

(1 mark for each correct definition / example of default constructor)

(1 mark for any difference / correct definition / correct example for destructor)

2. (a) Students are exposed to the concept of pointers, but not exposed specifically to the concept of "this" pointer. So benefit of doubt should be given to the students.

(Full 2 marks to be given to students who have correctly attempted for at least 1 mark in the entire Q. No. 2 (a) to 2 (d))

(b) (i) ```
Exam E(5);
```
*(1 mark for proper declaration of Object)*

(ii) ```
Exam (Exam &t)
{year = t.year;}
```
OR

Copy constructor: It is an overloaded constructor, in which object of the same class is passed as parameter.

(1 mark for writing proper statements inside definition of Constructor 2)

OR

(1 mark for any valid statement in C++ working with t as an object of Exam)

OR

(1 mark for writing the definition/explanation of the concept of copy constructor)

OR

(1/2 mark for mentioning only the term copy constructor)

(c)
```
class HOUSING
{
    int REG_NO;
    char NAME[20];
    char TYPE;
    float COST;
    public:
    void Read_Data();
    void Display();
    void Draw_Nos(HOUSING S);
};
void HOUSING::Read_Data()
{
    cin>>REG_NO;         //Validation not required
    cin>>NAME;           //OR gets(NAME);
    cin>>TYPE;    cin>>COST;
}
void HOUSING::Display()
{
    cout<<REG_NO<<NAME<<TYPE<<COST<<endl;
}
void HOUSING::Draw_Nos();//Ignore
```

(1/2 mark for proper syntax of class definition with correct class name and a semicolon to end the class definition)

(1/2 mark for mentioning the proper visibility modes (private / public))

(1 mark for proper declaration of private data members)

(1 mark for proper definition of Read_Data() with user entry for data members OR declaring a local object and entering the values of data members of this object)

(1 mark for proper definition of Display())

Note: As language of Third part of this question has ambiguity, it is required to be ignored. Moreover, if anyone has partially attempted the third part (i.e., Draw_nos function) and not attempted/not correctly attempted Read/Display function, he/she should be given 2 Marks for Third part taking into consideration the marks for this question should not exceed the max. marks allocated (i.e. 4 marks) to this question 2 (c).

(d) (i) Read_office_details
Disp_office_details.
(1 mark for correct names)

(ii) 29 bytes
OR
33 Bytes
(1 mark for correct answer)

(iii) Read_fur_details(),
Disp_fur_details,
Read_sofa_details( ),
Disp_sofa_details( ),
Disp_office_details( )
Read_office_details( ) **(Optional)**
(2 marks for correct answer)

3. (a)
```
const int R = 100, C = 100;
void Arrayconvert(int A1D[ ], int N)
{
    int A2D[R][C]={0};
    for(int I = 0; I<N; I++)
        for (int J = 0; J <=I; J++)
            A2D[I][J] = A1D[J];
}
```
(1 mark for proper function header)
(1 mark for proper use of loops)
(1 mark for proper assignment of values)

(b) For Row wise allocation
Address of A[I][J] = BA + W((I-LBR) x N + (J-LBC))
Where
BA = Base Address
W = Size of each element in bytes = 4 bytes (given)
N = No. of columns in the 2D Array = 10 (given)
Address of MAT[3][7] given is 1000.
Therefore
(Assumption 1: LBR = LBC = 0)
MAT[3][7]=100 = BA + 4 (10 (3-0) + (7-0))
                        = BA + 148
   BA = 1000 – 148
          = 852

Therefore,

    Base Address = 852

    Thus, Address of MAT[10][5] = 852 + 4 (10 (10-0) + (5-0))

$$= 852+420$$

$$= 1272$$

OR

(Assumption 2: LBR = LBC = 1)

MAT[3][7]=1000 = BA + 4 (10 (3-1) + (7-1))

$$= BA + 104$$

  BA = 1000 – 104

$$= 896$$

Therefore,

    Base Address = 896

    Thus, Address of MAT[10][5] = 896 + 4 (10 (10-1) + (5-1))

$$= 896+376$$

$$= 1272$$

(1 mark for writing the correct formula / correct substituted values, for row major properly, for calculating Base Address)

(1 mark for calculating correct Base Address)

(1 mark for writing the correct formula / correct substituted values, for row major properly, for calculating Address of MAT [10][5])

(1 mark for calculating correct address of MAT [10][5])

(c)
```
void stack::push()
{
    int n;
    cout<<"Enter a value";cin>>n;
    if (top==10)
        cout<<"Stack Overflow";
    else
        data[++top]=n;
}
void stack::pop()
{
    if (top==-1)
        cout<<"Stack Underflow";
    else
        cout<<data[top--];
}
void stack::Delete(int ITEM);//Ignore this part
```

[Push Operation]

(1/2 mark for checking overflow condition)

(1/2 mark for using increment in Top variable)

(1 mark for correct assignment of data in stack)

[Pop Operation]

(1/2 mark for checking underflow condition)

(1/2 mark for using decrement in Top variable)

(1 mark for displaying or returning value of the popped element from the stack)

Note: As language of Third part of this question has ambiguity with respect to Stack Operation, it is required to be ignored. Moreover, if anyone has partially attempted the third part (i.e. Delete function) and <u>not attempted/not correctly attempted</u> Push/Pop should be given 2 Marks for Third part taking into consideration the marks for this question should not exceed the max. marks allocated (i.e. 4 marks) to this question 3 (c).

(d)
```
struct Student
{
    char Name[20];Student  *Link;
};
class Queue
{
    Student  *FRONT, *REAR;
    public:
    Queue() { FRONT = NULL ; REAR = NULL}
    void Insert( );
};
void Queue::Insert()
{
    Student *Temp = new Student;
    gets(Temp->Name);
    Temp->Link = NULL;
    if(REAR==NULL)
    { FRONT=Temp; REAR = Temp;    }
    else
    {
        REAR->Link = Temp;
        REAR=Temp;
    }
}
```

OR

Any other code demonstrating proper Insert() for a dynamic Queue.

(1 mark for creating a dynamic Node and entering / assigning the value for Name)
(1 mark for creating a Link with the previous Node)
(1 mark for assigning new value of Rear.)

Note:

1. **Ignore the struct and class implementation while awarding marks in this question**

2. **Equivalent code with Dynamic Array should also be considered as correct solution**

(e) 10*3*(7-1)+23

(Full 2 marks to be given to students who have correctly attempted for at least 1 mark in the entire Q. No. 3 (a) to 3 (e))

Note: As students are exposed to Conversion from INFIX to POSTFIX and Evaluation of POSTFIX only, he/she may not be able to comprehend the conversion from POSTFIX to INFIX.

4.   (a)   4

(1 mark for correct output)
OR
(1 mark if error mentioned due to usage of tellg() with app mode)

(b)
```
void CountSpace()
{
    fstream fin;
    fin.open("PARA.TXT", ios::in);
    OR
    ifstream fin("PARA.TXT");
    char ch ;
    int count = 0;
    while(!fin.eof())
    {
        ch = fin.get();
        if (ch == ' ')          //(ch==32) OR (ch==255)
                count ++;
    }
    cout<<"Number of spaces = "<<count; //Ignore
    fin.close();                        //Ignore
}
```

OR

Any equivalent code that counts the number of words from the file

(1/2 Mark for opening the file in right mode)
(1/2 Mark for correct loop structure i.e. with a condition checking for end of file)
(1/2 Mark for reading a character / line from the file)
(1/2 Mark for checking for space and incrementing the counter)

(c)
```
void modify( )
{
    fstream out;

out.open("PRODUCT.DAT",ios::binary|ios::in|ios::out);
    PRODUCT P1;
    int flag=0,stock;char PCode[10];
    gets(PCode);
    cin>>stock;
    while (out.read((char*)&P1, sizeof(P1))
        if (strcmp(P1.Product_code,Pcode)==0)
                        // strcmpi()may also be considered
        {
            flag=1;
            P1.Stock=stock;
            int Position=out.tellg( )-sizeof(P1);
            out.seekp(Position);
            //OR
            out.seekp(-sizeof(P1),ios::cur);
            out.write((char*)&P1, sizeof(P1);
        }
    }
    if (flag==0) cout<<"Product Code does not match";
    //OR
    if (!flag) cout<<"Product Code does not match";
    out.close();
}
```

OR

Any other equivalent code

(1/2 Mark for opening the file in 'in' as well as 'out' mode)
(1/2 Mark for declaring object and temporary variables required for product code and stock)
(1/2 Marks for correct loop, check of end of file and reading of an object from the file)
(1/2 Mark for correct comparison)
(1/2 Mark for identifying and moving the file pointer to the correct position)
(1/2 Mark writing the modified/updated data on right position in the file)

5.   (a)   DDL – Data Definition Language

DML – Data Manipulation Language

(*1 Mark each for correct full form OR correctly explaining with the help of examples*)

(b)   (i)   SELECT FL_NO,NO_FLIGHTS FROM FLIGHTS
WHERE STARTING='KANPUR' AND ENDING='BANGALORE';

(*1/2 Mark for using SELECT and FROM correctly*)

(*1/2 Mark for correct WHERE clause*)

(ii)   SELECT * FROM FLIGHTS ORDER BY FL_NO;

(*1/2 Mark for using SELECT and FROM correctly*)

(*1/2 Mark for correct ORDER BY clause [ASC is optional]*)

(iii)   SELECT FLIGHTS.FL_NO, FARE+FARE*TAX/100
FROM FLIGHTS, FARES WHERE FLIGHTS.STARTING='DELHI' AND
FLIGHTS.ENDING='MUMBAI' AND FLIGHTS.FL_NO=FARES.FL_NO;

*Assuming TAX% as TAX

(*Full 1 Mark for correctly attempting any part of 5 (b)*)

(iv)   SELECT MIN(FARE) FROM FARES WHERE AIRLINES='INDIAN AIRLINES';

(**1/2 Mark for using SELECT and FROM with MIN function correctly**)

(**1/2 Mark for correct WHERE clause**)

(v)   FL_NO   NO_FLIGHTS   AIRLINES

IC302   8   Indian Airlines

AM501   1   Jet Airways

IC701   4   Indian Airlines

(*1 Mark for correct output, Ignore First header line*)

(vi)   7

(*1 Mark for correct output*)

6.   (a)   (i)   X+(Y+Z)=(X+Y)+Z

X	Y	Z	Y+Z	X+Y	X+(Y+Z)	(X+Y)+Z
0	0	0	0	0	0	0
0	0	1	1	0	1	1
0	1	0	1	1	1	1
0	1	1	1	1	1	1
1	0	0	0	1	1	1
1	0	1	1	1	1	1
1	1	0	1	1	1	1
1	1	1	1	1	1	1

(ii)   X.(Y.Z)=(X.Y).Z

X	Y	Z	Y.Z	X.Y	X.(Y.Z)	(X.Y).Z
0	0	0	0	0	0	0
0	0	1	0	0	0	0
0	1	0	0	0	0	0
0	1	1	1	0	0	0
1	0	0	0	0	0	0
1	0	1	0	0	0	0
1	1	0	0	1	0	0
1	1	1	1	1	1	1

(1 Mark for stating any one of the law)

(1 Mark for verification of any one of the law)

(b)   (A+C)'.(A+B)'.(B+C)'

(1/2 Mark each for (A+C)', (A+B)', (B+C)' and final expression)

OR

(Full 2 marks even if students have mentioned the reduced form of the same expression)

(c)   (P+Q').(P+R)

OR

(P+Q'+R).(P+Q'+R').(P+Q+R)

(1 Mark for any of the two POS forms of the given expression)

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(d)

Single II   Pair II

RS \ PQ	R+S	R+S'	R'+S'	R'+S
P+Q	(0) 0	1	0 3	2
P+Q'	4	0 5	0 7	0 6
P'+Q'	(0) 12	13	0 15	14
P'+Q	8	9	0 11	16

Quad I

Pair I

Single I

$F(P,Q,R,S)= (P+Q+R+S).(P'+Q'+R+S).(P+Q'+R').(P+Q'+S').(R'+S')$

(1 mark for representing correct places in K-Maps)
AND
(1/2 mark for grouping and writing minimum 2 Groups)
OR
(1 mark for grouping and writing minimum 3 Groups)
OR
(1 ½ mark for grouping and writing 5 Groups)
OR
(2 mark for grouping and writing final expression in reduced form)

Important: 1/2 Mark to be deducted for redundant group(s)

OR

Single I   Pair V   Pair IV

RS \ PQ	00	01	11	10
00	0	1 1	3	1 2
01	(1) 4	5	7	6
11	12	1 13	15	1 14
10	1 8	1 9	11	1 16

Pair III

Pair II

Pair I

$F(P,Q,R,S)=P'QR'S'+PQ'S'+PRS'+PR'S+Q'RS'+Q'R'S$

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(1 mark for representing correct places in K-Maps)

AND

(1/2 mark for grouping and writing minimum 2 Groups)

OR

(1 mark for grouping and writing minimum 4 Groups)

OR

(1 ½ mark for grouping and writing 6 Groups)

OR

(2 mark for grouping and writing final expression in reduced form)

Important: 1/2 Mark to be deducted for redundant group(s)

7. (a) **Optical Fiber**
Ethernet Cable or twisted pair cable or UTP or STP
Co-axial Cable
Infrared
Radio Link OR Radiowave
Microwave link OR Microwave
Satellite Link
[Any TWO of the mentioned above OR any other correct media]

(1/2 Mark for each correct answer)

(b) (i)   XML   Extensible Markup Language
(ii) GSM   Global System for Mobile communication   {ignore communication}
(iii) SMS   Short Messaging Service   {Message/Messaging both acceptable}
(iv) MAN   Metropolitan Area Network

(1/2 Mark for each correct answer)
(No marks for partially correct answers)

(c) Hackers: Computer enthusiasts who enjoy learning about computer systems and get into other system/network for gaining more knowledge or may find flaws in the system for rectification purposes.

Crackers: Malicious programmers who break into secure systems for stealing and corrupting/spoiling data.

(1/2 Mark for definition of each Hacker and Cracker)
OR
(Full 1 Mark for mentioning the difference)

(d) (i) Star Topology

OR

Bus Topology

(1 Mark for mentioning any one of the two topologies)
OR
(1 Mark for diagramatic representation of any of the above mentioned topologies)

(ii) Wing S

as it has the maximum number of computers

OR

Wing A

as it is placed in the Admin Wing (for security reasons)

(1/2 Mark for identification of the correct Wing)
(1/2 Mark for correct justification)

(iii) Inside all the four wings

(1 Mark for the correct answer)

(iv) Any one of the following:

Dialup, TCP/IP, DSL, Modem, Broadband, Cable, ISDN, Telephone Line, Co-axial, Ethernet Cable, Radiowave

(1 Mark for the correct answer)

Important Note: Satellite Link, Optical Fiber, Microwave and Leased line are not acceptable solution for this question

ENGINEERING DRAWING

Time allowed : 3 hours   *Maximum Marks : 70*

NOTE :

*(i)   Attempt **all** the questions.*

(ii)   Use both sides of the drawing sheet, if necessary.

(iii) All dimensons are in millimeters.

(iv)   Missing and mismatching dimensions, if any, may be suitably assumed.

(v)   Follow the SP : 46-1988 codes.
       (with First Angle method of projection).

QUESTION PAPER CODE 68/1

1.   (a)   Construct an isometric scale.   4

     (b)   Construct the isometric projection of a frustum of a cone, whose base diameter
           is 60 mm, top diameter is 50 mm and height is 70 mm, is resting on H.P. on
           its circular base of diameter 60 mm. Give all dimensions.   6

     (c)   A pentagonal prism with side 40 mm and height 80 mm, is centrally placed
           with its pentagonal end on the top circular face of a cylindrical disc with a
           diameter of 100 mm and thickness 40 mm. One side of the pentagonal end
           at the bottom is normal to V.P. and the common axis is normal to H.P. and
           parallel to V.P.
           Draw the isometric projection of the two solids, placed together. Give all
           dimensions.   15

2.   (a)   Draw to scale 1:1 the standard profile of a BSW thread, taking enlarged
           pitch as 60 mm. Give standard dimensions.   9

                                    Or

           Draw to scale 1:1 the full sectional front elevation of a single riveted lap joint,
           taking thickness of the plates as 25 mm. Give standard dimensions.

     (b)   Sketch freehand a Woodruff-key, in position, on a shaft of diameter 60 mm,
           keeping the axis of the shaft parallel to HP and V.P., showing top-half sectional
           front elevation. Give standard dimensions.   6

                                    Or

           Sketch freehand the front view and top view of a Grub screw of size M25,
           keeping its axis vertical. Give standard dimensions.

3. Fig. 1 shows the details of the parts of a flanged pipe joint. Assemble these parts correctly and then draw the following views to a scale full size :

(a) Sectional front view, top half in section   15

(b) Side view, as seen from left.   10

Print title and the scale used. Draw the projection symbol. Give 6 important dimensions.   5

FIG. 1

FLANGED PIPE JOINT

Or

Fig. 2 shows the front view of a solid C.I. pulley, draw the following views to a scale full size :

(a) Front view, showing top-half in section.   15

(b) Side view, as seen from right.   10

Print title and the scale used. Draw the projection symbol. Give 6 important dimensions.   5

SOLID C.I. PULLEY

KEYWAY
5×2

4 HOLES

FIG. 2

QUESTION PAPER CODE 68

1. (a) Construct an isometric scale. 4

(b) Construct an isometric projection of a hemisphere of diameter 90 mm, having its circular face, parallel to H.P., on the upper-side. Give all dimensions. 6

(c) A cone with base diameter 50 mm and height 80 mm, is centrally placed with its circular base on the square top surface (top side 60 mm) of the frustum of a square pyramid (bottom side 80 mm) and height 70 mm. Keeping the common axis vertical and two parallel sides of the bottom surface of the frustum, parallel to V.P., draw the isometric projection of the solids, placed together. Give all dimensions. 15

2. (a) Draw to scale 1:1, the standard profile of a metric screw thread (internal), taking enlarged pitch as 60 mm. Give standard dimensions.   9

<div align="center">**OR**</div>

Draw to scale 1 : 1, the front view and plan of a hook bolt with diameter 25 mm, keeping the axis vertical. Give standard dimensions.

(b) Sketch freehand the front view, side view and plan of a double-head gib key for a shaft of diameter 48 mm. Give standard dimensions.   6

<div align="center">**OR**</div>

Sketch freehand the front view and top view of a snap-head rivet of diameter 30 mm, keeping its axis vertical. Give standard dimensions.

3. Fig. 1 shows the details of the parts of a Turnbuckle'. Inserting 65 mm length of each one of the threaded ends of the rods A and B, assemble these parts correctly and then draw the following views to a scale full size :

(a) Sectional front view, top half in section   13

(b) Plan   12

Print title and scale used. Draw the projection symbol. Give 6 important dimensions.   5

FIG 1.

OR

Fig. 2 shows the details of the parts of a 'Bushed Bearing". Assemble these parts correctly and then draw the following views to a scale full size :

(a) Sectional front view, showing right half in section   15

(b) Plan   10

Print title and the scale used. Draw the projection symbol. Give 6 important dimensions.   5

FIG 2

Marking Scheme—Engineering Drawing

> *NOTE :*
>
> (i)   Dimensioning mistakes of ±1 mm to be ignored.
>
> (ii) Arrow heads of various types and all methods of dimensioning as per SP : 46-1988 codes should be treated as correct.
>
> (iii) Give marks proportionate to the work done.

QUESTION PAPER CODE 68/1

Q.NO.	VALUE POINTS	MARKS

1. The following portions drawn correctly and accurately with good line work :

    (a) **Isometric scale**   **5**

    (b) **Isometric Projection of a Frustum of Right Circular cone :**

        (i)   Upper ellipse   2

        (ii) Bottom ellipse   1

        (iii) Tangent lines to ellipses   1

        (iv) Dimensions   2

    (c) **Isometric Projection of a Pentagonal Prism on a circular disc :**

        <u>**Circular Disc**</u>

        (i)   Upper ellipse   2

        (ii) Bottom ellipse   1

        (iii) Common tangents   2

        (iv) Dimensions   1

        <u>**Pentagonal Prism**</u>

        (i)   Helping view   1

        (ii) Placed centrally   1

        (iii) Two Pentagons   3

        (iv) Face edges   1

        (v)   Dimensions   2

        Note : For incorrect position of each solid deduct (1) mark.

                                                         25

2.   (a)   **Profile of a BSW thread (Scale - 1:1)**

         (i)   Construction of threaded profile with hatching lines   (5+1)

         (ii)   Good line work and dimensions   (2+1)

         Note : Deduct 1 marks if sketched free-hand.

<div align="center">(OR)</div>

         Sectional Front view of a single riveted lap joint (1:1)

         (i)   Two rivet heads   2

         (ii)   Two plates   2

         (iii)   Hatching lines   2

         (iv)   Good line work and dimensioning   (2+1)

         Note : Deduct 1 marks if sketched free-hand.

   (b)   The following portions sketched free-hand and drawn proportionately :

         WOODRUFF KEY

         (i)   Woodruff Key in position on the shaft   1

         (ii)   Woodruff Key   2

         (iii)   Upper half in section with hatching lines   2

         (iv)   Dimensions   1

         Note : Deduct 1 mark, if drawn with instruments.

<div align="center">OR</div>

         GRUB SCREW :

         (i)   Front View   3

         (ii)   Top View   2

         (iii)   Dimensions   1

         Note : Deduct 1 mark, if drawn with instruments.

3.   **FLANGED PIPE JOINT**

   The following portions drawn correctly and accurately :

   (a)   **FRONT VIEW TOP/UPPER HALF IN SECTION**

         (i)   Upper/Top half in section   4

         (ii)   Square Bolt   2

         (iii)   Hexagonal Nut   2

         (iv)   Rubber washer in position/section   1

         (v)   Hatching Lines   2

         (vi)   Lower half without section   2

         (vii)   Nuts & Bolts on PCD   2

Q.NO.	VALUE POINTS	MARKS

(b) SIDE VIEW AS SEEN FROM LEFT

(i)	Circles	4
(ii)	Nuts	2
(ii)	Hatching	1

DIMENSIONS ETC.

(i)	Title	1
(ii)	First angle symbol	1
(iii)	Scale Used	1
(iv)	Dimensions	3
(v)	Line work in front and side view	(1+1)

Note : Do not deduct marks if only one nut is shown on P.C.D.

OR

SOLID CAST IRON PULLEY :

(a) FRONT VIEW TOP/UPPER HALF IN SECTION

(i)	Crowning	1
(ii)	Hole in the solid wall/web	1
(iii)	Solid wall/Web	2
(iv)	Shaft Hub	2
(v)	Hatching	3

LOWER HALF WITHOUT SECTION

(i)	Lower half shown without section	3
(ii)	Crowning	1
(iii)	Lines indicating the pulley width	1
(iv)	Hub Profile	1

(b) RIGHT SIDE VIEW

(i)	Five circles	4
(ii)	Key Way	1
(iii)	Four holes in the solid wall/Web	2

DIMENSIONS ETC.

(i)	Title	1
(ii)	First angle symbol	1
(iii)	Scale Used	1
(iv)	Dimensions	3
(v)	Line work in front and side view	(1+1)

Note : (i) Do not deduct marks if only one hole is shown and rest as centers on P.C.D.

(ii) No marks are allotted for hidden lines.

HELPING VIEW

ISO-PROJECTION

ISOMETRIC SCALE

TRUE LENGTHS IN mm

1a

68/1

1b

1c

ISO-PROJECTION

DIA 100

30°

40

80

40

40

φ50

φ60

70

ISO-PROJECTION

$d = 0.64p$

$D = 0.96p$

$p = $ PITCH $= 60$

$p = 60$

$55°$

B.S.W. THREAD

OR

$L = 25$

$1.5d$

$0.1d$

d

$R = 0.8d$

$\theta = 10°$

$1.5d$

t

SINGLE RIVETED LAP JOINT

2a

2a

318

T/4

R=2T

d=60

WOODRUFF KEY

2 b

T/4

R=2T

T

WOODRUFF KEY

T

OR

0·2d

0·2d

10·4d

45°

d=25

GRUB SCREW

2 b

CODE: 68/1

SECTIONAL FRONT VIEW AT A-A'

50

Ø40

10

10

Ø10

5

2,CROWN

OR

4 HOLES Ø 10, 130 P.C.D.

Ø130

Ø20

Ø140

A

A'

2

5

SIDE VIEW

SOLID C.I. PULLEY

SCALE 1:1

3

320

4 BOLTS, SQ.HEX.NUTS ON 106 P.C.D.

Ø 74

Ø 80

Ø 132

SIDE VIEW

R-31

DIA 80

Ø 10

20

12

12

20

3

DIA 74

SECTIONAL FRONT VIEW AT A-A'

FLANGED PIPE JOINT   SCALE 1:1

3

321

Q.NO.	VALUE POINTS	MARKS

1. The following portions drawn correctly and accurately with good line work :

   (a) **Isometric scale**   5

   (b) **Isometric projection of a Hemisphere :**

       (i)   Upper ellipse   3

       (ii) Semi-Circle with scale 1:1   1

       (iii) Dimensions   2

   (c) **Isometric Projection of a Cone on a Frustum of Sq. Pyramid :**

     Cone

       (i)   Common Axis   2

       (ii) Bottom ellipse   2

       (iii) Common tangents (Slant Edges)   2

       (iv) Dimensions   1

     Frustum of a Square Pyramid

       (i)   Placed centrally   1

       (ii) Two Squares   3

       (iii) Face edges   1

       (iv) Dimensions   2

     Note : For incorrect positon of each solid deduct (1) mark.

                                       25

2. (a) **PROFILE OF A METRIC SCREW THREAD (INTERNAL Scale-1:1)**

       (i)   Construction of thread profile with hatching lines   (5+1)

       (ii) Good line work and dimensioning   (2+1)

     Note : Deduct 1 marks if sketched free-hand.

                OR

     HOOK BOLT (Scale 1:1)

       (i)   Front View   4

       (ii) Top View   2

       (iii) Good line work and dimensioning   (2+1)

     Note : Deduct 1 marks if sketched free-hand.

   (b) The following portions sketched free-hand and drawn proportionately :

     DOUBLE-HEAD GIB KEY :

       (i)   Front View   2

       (ii) Top View   2

       (iii) Side View   1

       (iv) Dimensions   1

     Note : Deduct 1 mark, if drawn with instruments.

<div align="center">

OR
</div>

SNAP-HEAD RIVET :

(i)   Front view   3

(ii)   Top view   2

(iii)   Dimensions   1

Note : Deduct 1 mark, if drawn with instruments.

3.   **TURNBUCKLE :**

The following portions drawn correctly and accurately :

(a)   **SECTIONAL FRONT VIEW, TOP/UPPER HALF IN SECTION**

    (I)   **Body**

        (i)   Two Conical Ends   5

        (ii)   Straight Portion   1

        (iii) Hatching Lines   2

    (II) Rods A and B with 65 mm length inserted in the main body of the

        Turnbuckle.   3

(b) **PLAN**

    (i)   Two conical ends   3

    (ii)   Straight portions of Body   5

    (iii) Rods A and B in position   3

    Dimensions etc.

    (i)   Title   1

    (ii)   First angle symbol   1

    (iii) Scale Used   1

    (iv) Dimensions   3

    (v)   Line work in front and side view   (1+1)
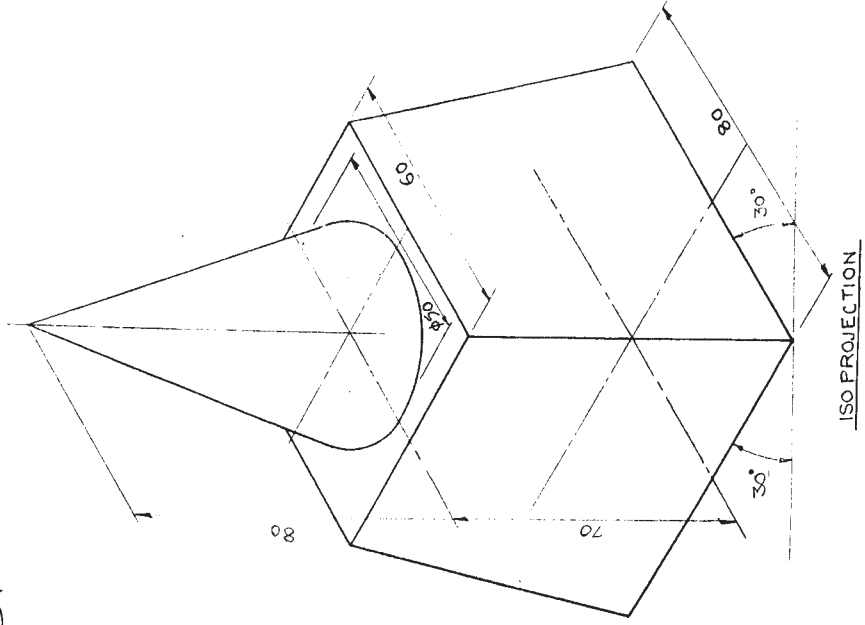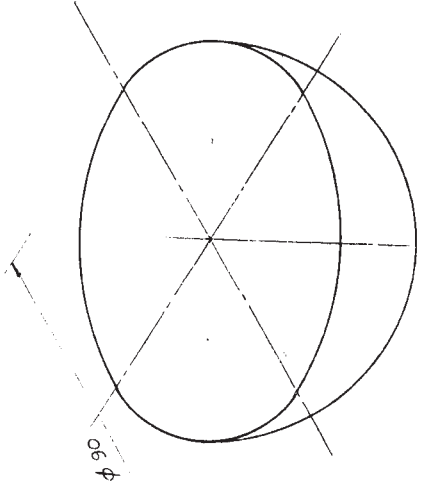
Note : Deduct 2 marks if Rods A and B are not inserted upto 65 mm in length

    in the Turnbuckle Body.

<div align="center">

OR

BUSHED BEARING

</div>

SECTIONAL FRONT VIEW, RIGHT HALF IN SECTION

(a) Body

(i)	Clearance/Air Gap (130×30×2)	2
(ii)	Two Holes (20×14)	2
(iii)	Oil Hole	2
(iv)	Upper Body	3
(v)	Hatching	2
(vi)	Bush	2

(b) **PLAN**

(i)	Clearance/Air Gap	2
(ii)	Two Holes (20×14)	2
(iii)	Oil Hole	2
(iv)	Rest of the Body	2
(vi)	Bush	2

Dimensions etc.

(i)	Title	1
(ii)	First angle symbol	1
(iii)	Scale Used	1
(iv)	Dimensions	2
(v)	Line work in front and side view	(1+1)

CODE : 68

1c

ISO PROJECTION

60

80

80

70

30°

30°

Ø50

1a

TRUE LENGTHS

ISO-LENGTHS

ISOMETRIC SCALE

30° 45°

1b

ISO PROJECTION

Ø90

325

Q2 a.

$P = 60 mm$
$D = 0.866 P$
$d = 0.54 P$

$D/8$

$D/4$

$60°$

P

METRIC SCREW THREAD INTERNAL

Q2 b.

FRONT VIEW

$45°$

L

TOP VIEW.

W

SIDE VIEW

$d = 48$
$W = d/4$
$T = 2/3 W$
$B = 1.5 T$
$H = 1.7 T$
$L = 1.5d + 0.7d$

DOUBLE HEAD GIB KEY

326

Q2b.

FRONT VIEW

0.8d

1.7d

1.5d

TOP VIEW

SNAP HEAD RIVET

Q2a.

.8d

0.9d   FRONT VIEW

TOP VIEW

HOOK BOLT

BUSHED BEARING

SECTIONAL FRONT VIEW AT A A'

SYMBOL OF FIRST ANGLE

Ø50

R5

10

Ø35

60°

150

90

Ø50

20

BASE

10

TOP VIEW

SCALE 1:1

50

30

30

50

328

TURN BUCKLE

SCALE 1:1

SYMBOL OF FIRST ANGLE

CODE : GR

SECTIONAL FRONT VIEW AT AA'

TOP VIEW

φ30

0.50

26

170

35

10

φ20

A

A'

Q3.

329