CLASS : XII

SESSION: 2023-24

CBSE SAMPLE QUESTION PAPER

SUBJECT: PHYSICS (THEORY)

Maximum Marks: 70 **Time Allowed**: 3 hours.

General Instructions:

(1) There are 33 questions in all. All questions are compulsory.
(2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
(3) All the sections are compulsory.
(4) **Section A** contains sixteen questions, twelve MCQ and four Assertion Reasoning based of 1 mark each, **Section B** contains five questions of two marks each, **Section C** contains seven questions of three marks each, **Section D** contains two case study based questions of four marks each and **Section E** contains three long answer questions of five marks each.
(5) There is no overall choice. However, an internal choice has been provided in one question in Section B, one question in Section C, one question in each CBQ in Section D and all three questions in Section E. You have to attempt only one of the choices in such questions.
(6) Use of calculators is not allowed.
(7) You may use the following values of physical constants where ever necessary
   i. $c = 3 \times 10^8$ m/s
   ii. $m_e = 9.1 \times 10^{-31}$ kg
   iii. $e = 1.6 \times 10^{-19}$ C
   iv. $\mu_0 = 4\pi \times 10^{-7}$ TmA^{-1}
   v. $h = 6.63 \times 10^{-34}$ Js
   vi. $\varepsilon_0 = 8.854 \times 10^{-12}$ $C^2N^{-1}m^{-2}$
   vii. Avogadro's number = 6.023 X 10^{23} per gram mole

SECTION-A

1. Which of the following is **not** the property of an equipotential surface?
(a) They do not cross each other.
(b) The work done in carrying a charge from one point to another on an equipotential surface is zero.
(c) For a uniform electric field, they are concentric spheres.
(d) They can be imaginary spheres.

2. An electric dipole placed in an electric field of intensity 2×10^5 N/C at an angle of 30° experiences a torque equal to 4 Nm. The charge on the dipole of dipole length 2 cm is
(a) 7 μC (b) 8 mC (c) 2 mC (d) 5 mC

3. A metallic plate exposed to white light emits electrons. For which of the following colours of light, the stopping potential will be maximum?
(a) Blue (b) Yellow (c) Red (d) Violet

4. When alpha particles are sent through a thin gold foil, most of them go straight through the foil, because
(a) alpha particles are positively charged
(b) the mass of an alpha particle is more than the mass of an electron
(c) most of the part of an atom is empty space
(d) alpha particles move with high velocity

5. An electron is moving along positive x-axis in a magnetic field which is parallel to the positive y-axis. In what direction will the magnetic force be acting on the electron?
(a) Along -x axis (b) Along -z axis
(c) Along +z axis (d) Along -y axis

6. The relative magnetic permeability of a substance X is slightly less than unity and that of substance Y is slightly more than unity, then
(a) X is paramagnetic and Y is ferromagnetic
(b) X is diamagnetic and Y is ferromagnetic
(c) X and Y both are paramagnetic
(d) X is diamagnetic and Y is paramagnetic

7. An ammeter of resistance 0.81 ohm reads up to 1 A. The value of the required shunt to increase the range to 10 A is
(a) 0.9 ohm (b) 0.09 ohm (c) 0.03 ohm (d) 0.3 ohm

8. An electron with angular momentum L moving around the nucleus has a magnetic moment given by
(a) e L/ 2m (b) e L/3m (c) e L /4m (d) e L / m

9. The large scale transmission of electrical energy over long distances is done with the use of transformers. The voltage output of the generator is stepped-up because of
(a) reduction of current (b) reduction of current and voltage both
(c) power loss is cut down (d) (a) and (c) both

10. The diagram below shows the electric field (**E**) and magnetic field (**B)** components of an electromagnetic wave at a certain time and location.

The direction of the propagation of the electromagnetic wave is

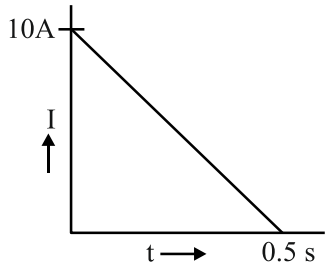
(a) perpendicular to **E** and **B** and out of plane of the paper

(b) perpendicular to **E** and **B** and into the plane of the paper

(c) parallel and in the same direction as **E**

(d) parallel and in the same direction as **B**

11. In a coil of resistance 100 Ω a current is induced by changing the magnetic flux through it. The variation of current with time is as shown in the figure. The magnitude of change in flux through coil is



(a) 200 Wb (b) 275 Wb (c) 225 Wb (d) 250 Wb

12. The energy of an electron in n^{th} orbit of hydrogen atom is $E_n = -13.6/n^2 eV$. The negative sign of energy indicates that

(a) electron is free to move.

(b) electron is bound to the nucleus.

(c) kinetic energy of electron is equal to potential energy of electron.

(d) atom is radiating energy.

For Questions 13 to 16, two statements are given –one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options as given below.

a) If both Assertion and Reason are true and Reason is correct explanation of Assertion.

b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

c) If Assertion is true but Reason is false.

d) If both Assertion and Reason are false.

13. **Assertion** (A): For the radiation of a frequency greater than the threshold frequency, photoelectric current is proportional to the intensity of the radiation.

Reason (R) : Greater the number of energy quanta available, greater is the number of electrons absorbing the energy quanta and greater is number of electrons coming out of the metal.

14. **Assertion (A)** : Putting p type semiconductor slab directly in physical contact with n type semiconductor slab cannot form the pn junction.

Reason (R) : The roughness at contact will be much more than inter atomic crystal spacing and continuous flow of charge carriers is not possible.

15. **Assertion (A) :** An electron has a higher potential energy when it is at a location associated with a negative value of potential and has a lower potential energy when at a location associated with a positive potential.

Reason (R) : Electrons move from a region of higher potential to a region of lower potential.

16. **Assertion (A) :** Propagation of light through an optical fibre is due to total internal reflection taking place at the core-cladding interface.

Reason (R): Refractive index of the material of the cladding of the optical fibre is greater than that of the core.

SECTION-B

17. (a) Name the device which utilizes unilateral action of a pn diode to convert ac into dc.

(b) Draw the circuit diagram of full wave rectifier.

18. The wavelength λ of a photon and the de Broglie wavelength of an electron of mass m have the same value. Show that the energy of the photon is 2λmc/h times the kinetic energy of the electron, where c and h have their usual meanings.

19. A ray of monochromatic light passes through an equilateral glass prism in such a way that the angle of incidence is equal to the angle of emergence and each of these angles is 3/4 times the angle of the prism. Determine the angle of deviation and the refractive index of the glass prism.

20. A heating element using nichrome connected to a 230 V supply draws an initial current of 3.2 A which settles after a few seconds to a steady value of 2.8 A. What is the steady temperature of the heating element if the room temperature is 27.0 °C and the temperature coefficient of resistance of nichrome is $1.70 \times 10^{-4}\ °C^{-1}$?

21. Show that the least possible distance between an object and its real image in a convex lens is 4f, where f is the focal length of the lens.

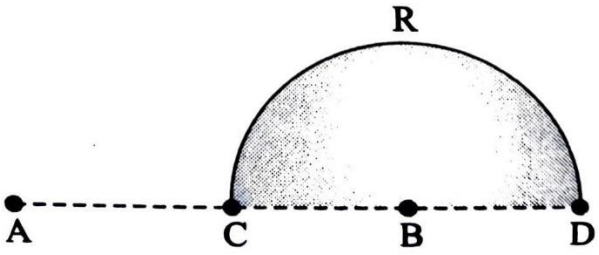
OR

In an astronomical telescope in normal adjustment a straight black line of length L is drawn on the objective lens. The eyepiece forms a real image of this line whose length is l. What is the angular magnification of the telescope?

SECTION-C

22. A given coin has a mass of 3.0 g. Calculate the nuclear energy that would be required to separate all the neutrons and protons from each other. For simplicity assume that the coin is entirely made of $^{63}_{29}Cu$ atoms (of mass 62.92960 u).
Given m_p = 1.007825u and m_n = 1.008665u.

23. Charges (+*q*) and (–*q*) are placed at the points A and B respectively which are a distance 2L apart. C is the midpoint between A and B. What is the work done in moving a charge +Q along the semicircle CRD.



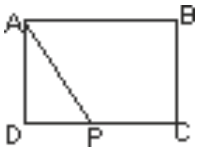
24. The total energy of an electron in the first excited state of the hydrogen atom is about –3.4 eV.

a. What is the kinetic energy of the electron in this state?

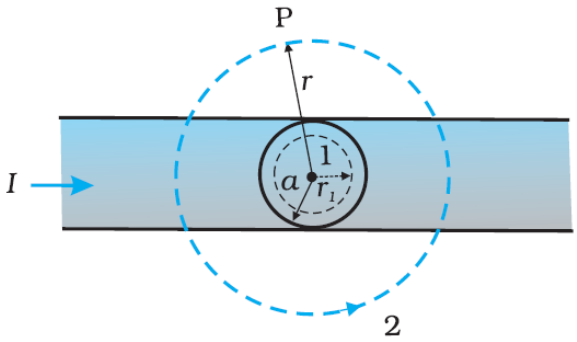
b. What is the potential energy of the electron in this state?

c. Which of the answers above would change if the choice of the zero of potential energy is changed?

25. A wire of uniform cross-section and resistance 4 ohm is bent in the shape of square ABCD. Point A is connected to a point P on DC by a wire AP of resistance 1 ohm. When a potential difference is applied between A and C, the points B and P are seen to be at the same potential. What is the resistance of the part DP?



26. The given figure shows a long straight wire of a circular cross-section (radius *a*) carrying steady current *I*. The current *I* is uniformly distributed across this cross-section. Calculate the magnetic field in the region $r < a$ and $r > a$.



27. Identify the part of the electromagnetic spectrum which:

a) produces heating effect,
b) is absorbed by the ozone layer in the atmosphere,
c) is used for studying crystal structure.

Write any one method of the production of each of the above radiations.

28. a. Define mutual inductance and write its SI unit.

b. Two circular loops, one of small radius *r* and other of larger radius R, such that R >> *r*, are placed coaxially with centres coinciding. Obtain the mutual inductance of the arrangement.

OR

Two long straight parallel current carrying conductors are kept 'a' distant apart in air. The direction of current in both the conductors is same. Find the magnitude of force per unit length and direction of the force between them. Hence define one ampere.

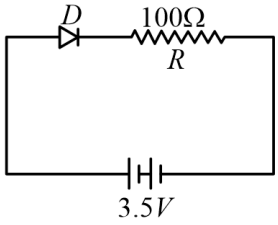
SECTION-D

Case Study Based Questions

29. Read the following paragraph and answer the questions that follow.

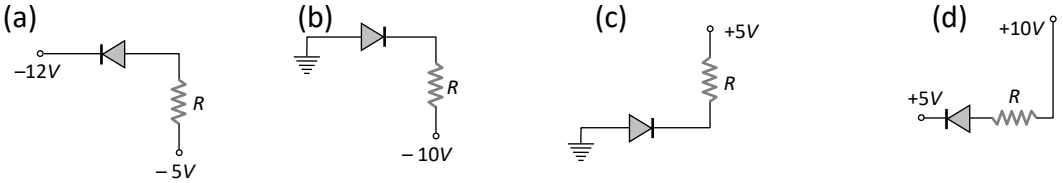
A semiconductor diode is basically a pn junction with metallic contacts provided at the ends for the application of an external voltage. It is a two terminal device. When an external voltage is applied across a semiconductor diode such that p-side is connected to the positive terminal of the battery and n-side to the negative terminal, it is said to be forward biased. When an external voltage is applied across the diode such that n-side is positive and p-side is negative, it is said to be reverse biased. An ideal diode is one whose resistance in forward biasing is zero and the resistance is infinite in reverse biasing. When the diode is forward biased, it is found that beyond forward voltage called knee voltage, the conductivity is very high. When the biasing voltage is more than the knee voltage the potential barrier is overcome and the current increases rapidly with increase in forward voltage. When the diode is reverse biased, the reverse bias voltage produces a very small current about a few microamperes which almost remains constant with bias. This small current is reverse saturation current.

i. In the given figure, a diode *D* is connected to an external resistance *R* = 100 Ω and an emf of 3.5 *V*. If the barrier potential developed across the diode is 0.5 *V*, the current in the circuit will be:



(a) 40 mA (b) 20 mA (c) 35 mA (d) 30 mA

ii. In which of the following figures, the pn diode is reverse biased?



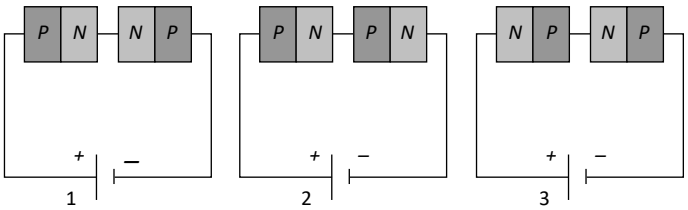
iii. Based on the V-I characteristics of the diode, we can classify diode as

(a) bilateral device (b) ohmic device

(c) non-ohmic device (d) passive element

OR

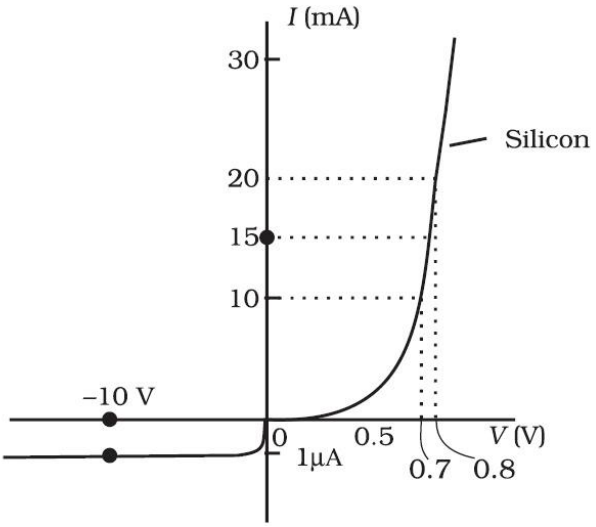
Two identical *PN* junctions can be connected in series by three different methods as shown in the figure. If the potential difference in the junctions is the same, then the correct connections will be



(a) in the circuits (1) and (2) (b) in the circuits (2) and (3)

(c) in the circuits (1) and (3) (d) only in the circuit (1)

iv.



The V-I characteristic of a diode is shown in the figure. The ratio of the resistance of the diode at I = 15 mA to the resistance at V = -10 V is

(a) 100 (b) 10^6 (c) 10 (d) 10^{-6}

30. Read the following paragraph and answer the questions that follow.

Types of Lenses and their combination

A convex or converging lens is thicker at the centre than at the edges. It converges a beam of light on refraction through it. It has a real focus. Convex lens is of three types: Double convex lens, Plano convex lens and Concavo-convex lens.

Concave lens is thinner at the centre than at the edges. It diverges a beam of light on refraction through it. It has a virtual focus. Concave lenses are of three types: Double concave lens, Plano concave lens and Convexo-concave lens.

When two thin lenses of focal lengths f_1 and f_2 are placed in contact with each other along their common principal axis, then the two lens system is regarded as a single lens of focal length *f* and

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$$

If several thin lenses of focal length f_1, f_2, ... f_n are placed in contact, then the effective focal length of the combination is given by

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} + ... + \frac{1}{f_n}$$

and in terms of power, we can write

$$P = P_1 + P_2 + ... + P_n$$

The value of focal length and power of a lens must be used with proper sign consideration.

i. Two thin lenses are kept coaxially in contact with each other and the focal length of the combination is 80 cm. If the focal length of one lens is 20 cm, the focal length of the other would be

(a) -26.7cm (b) 60cm (c) 80cm (d) 30cm

ii. A spherical air bubble is embedded in a piece of glass. For a ray of light passing through the bubble, it behaves like a

(a) converging lens
(b) diverging lens
(c) mirror
(d) thin plane sheet of glass

iii. Lens generally used in magnifying glass is

(a) single concave lens
(b) single convex lens
(c) combination of convex lens of lower power and concave lens of lower focal length
(d) Planoconcave lens

iv. The magnification of an image by a convex lens is positive only when the object is placed

(a) at its focus F
(b) between F and 2F
(c) at 2F
(d) between F and optical centre

OR

A convex lens of 20 cm focal length forms a real image which is three times magnified. The distance of the object from the lens is

(a) 13.33 cm (b) 14 cm (c) 26.66 cm (d) 25 cm

SECTION-E

31. i. Draw a ray diagram for the formation of image of a point object by a thin double convex lens having radii of curvature R_1 and R_2. Hence derive lens maker's formula.

ii A converging lens has a focal length of 10 cm in air. It is made of a material of refractive index 1.6. If it is immersed in a liquid of refractive index 1.3, find its new focal length.

OR

i. Define a wavefront. How is it different from a ray?

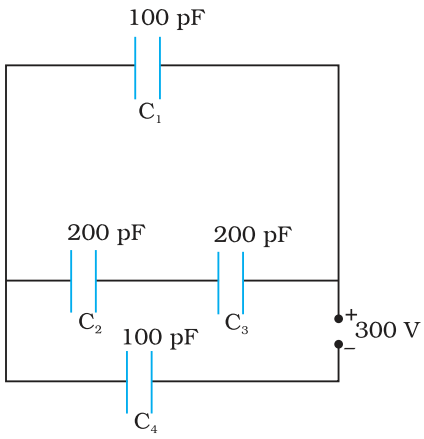
ii. Using Huygens's construction of secondary wavelets draw a diagram showing the passage of a plane wavefront from a denser to a rarer medium. Using it verify Snell's law.

iii. In a double slit experiment using light of wavelength 600nm and the angular width of the fringe formed on a distant screen is 0.1°. Find the spacing between the two slits.

iv. Write two differences between interference pattern and diffraction pattern.

32. i. Derive an expression for the capacitance of a parallel plate capacitor with air present between the two plates.

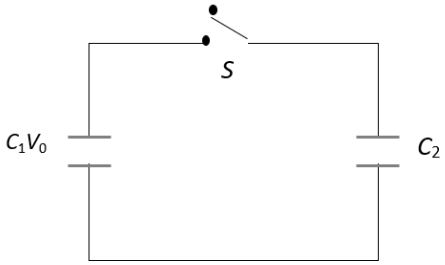
ii. Obtain the equivalent capacitance of the network shown in figure. For a 300 V supply, determine the charge on each capacitor.



OR

i. A dielectric slab of thickness 't' is kept between the plates of a parallel plate capacitor with plate separation 'd' ($t < d$). Derive the expression for the capacitance of the capacitor.

ii. A capacitor of capacity C_1 is charged to the potential of V_o. On disconnecting with the battery, it is connected with an uncharged capacitor of capacity C_2 as shown in the adjoining figure. Find the ratio of energies before and after the connection of switch S.



33.a. Draw graphs showing the variations of inductive reactance and capacitive reactance with frequency of applied ac source.

b. Draw the phasor diagram for a series LRC circuit connected to an AC source.

c. When an alternating voltage of 220V is applied across a device X, a current of 0.25A flows which lags behind the applied voltage in phase by π/2 radian. If the same voltage is applied across another device Y, the same current flows but now it is in phase with the applied voltage.
(i) Name the devices X and Y.
(ii) Calculate the current flowing in the circuit when the same voltage is applied across the series combination of X and Y.

OR

a. A series LCR circuit is connected to an ac source. Using the phasor diagram, derive the expression for the impedance of the circuit.

b. Plot a graph to show the variation of current with frequency of the ac source , explaining the nature of its variation for two different resistances R_1 and R_2 ($R_1 < R_2$) at resonance.

SAMPLE PAPER (2023 -24)

CHEMISTRY THEORY (043)

Max. Marks:70 **Time: 3 hours**

General Instructions:

Read the following instructions carefully.

(a) There are **33** questions in this question paper with internal choice.

(b) SECTION A consists of 16 multiple –choice questions carrying 1 mark each.

(c) SECTION B consists of 5 short answer questions carrying 2 marks each.

(d) SECTION C consists of 7 short answer questions carrying 3 marks each.

(e) SECTION D consists of 2 case – based questions carrying 4 marks each.

(f) SECTION E consists of 3 long answer questions carrying 5 marks each.

(g) All questions are compulsory.

(h) Use of log tables and calculators is not allowed.

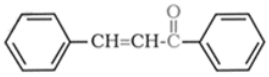
SECTION A

The following questions are multiple -choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1. Which of the following solutions will have the highest conductivity at 298 K?

   (a) 0.01 M HCl solution (b) 0.1 M HCl solution

   (c) 0.01 M CH_3COOH solution (d) 0.1 M CH_3COOH solution

2. $A + B \xrightarrow{\text{dil NaOH}}$ 

   Identify A and B:

   (a) A = 1–phenylethanal , B = acetophenone (b) A = Benzophenone B = formaldehyde

   (c) A= Benzaldehyde , B = Acetophenone (d) A = Benzophenone , B = Acetophenone

3. The vitamins which can be stored in our body are:

   (a) Vitamin A, B, D and E (d) Vitamin A, C, D and K

   (c) Vitamin A, B, C and D (d) Vitamin A, D, E and K

4. What is IUPAC name of the ketone A, which undergoes iodoform reaction to give $CH_3CH= C(CH_3)COONa$ and yellow precipitate of CHI_3 ?

   (a) 3–Methylpent–3–en–2one (b) 3–Methylbut–2–en– one

   (c) 2, 3–Dimethylethanone (d) 3–Methylpent–4–one

5. Which of the following is not correct?

   (a) In haloarenes, the electron pairs on halogen atom are in conjugation with π–electrons of the ring.

   (b) The carbon–magnesium bond is covalent and non–polar in nature.

   (c) During S_N1 reaction, the carbocation formed in the slow step being sp^2 hybridised is planar.

   (d) Out of $CH_2= CH–Cl$ and $C_6H_5CH_2Cl$, $C_6H_5CH_2Cl$ is more reactive towards S_N1 reaction

6. Match the properties with the elements of 3d series:

(i) lowest enthalpy of atomisation	(p) Sc
(ii) shows maximum number of oxidation states	(q) Mn
(iii) transition metal that does not form coloured compounds	(r) Zn
	(s) Ti

(a) (i) (r), (ii) (q), (iii) (p) (b) (i) (r), (ii) (s), (iii) (p)

(c) (i) (p), (ii) (q), (iii) (r) (d) (i) (s), (ii) (r), (iii) (p)

7. Which of the following statement is true?

(a) molecularity of reaction can be zero or a fraction.

(b) molecularity has no meaning for complex reactions.

(c) molecularity of a reaction is an experimental quantity

(d) reactions with the molecularity three are very rare but are fast.

8. In which of the following solvents, the $C_4H_8NH_3^+X^-$ is soluble;

(a) ether (b) acetone (c) water (d) bromine water

9. Which of the following observation is shown by 2 -phenyl ethanol with Lucas Reagent?

(a) Turbidity will be observed within five minutes

(b) No turbidity will be observed

(c) Turbidity will be observed immediately

(d) Turbidity will be observed at room temperature but will disappear after five minutes.

10. If the initial concentration of substance A is 1.5 M and after 120 seconds the concentration of substance A is 0.75 M, the rate constant for the reaction if it follows zero - order kinetics is:

(a) 0.00625 $molL^{-1}s^{-1}$ (b) 0.00625 s^{-1} (c) 0.00578 $molL^{-1}s^{-1}$ (d) 0.00578 s^{-1}

11. Anisole undergoes bromination with bromine in ethanoic acid even in the absence of iron (III) bromide catalyst

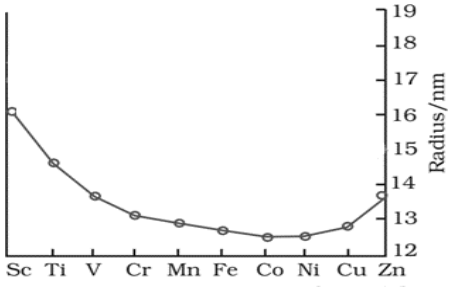
(a) Due to the activation of benzene ring by the methoxy group.

(b) Due to the de-activation of benzene ring by the methoxy group.

(c) Due to the increase in electron density at ortho and para positions

(d) Due to the formation of stable carbocation.

12. The trend of which property is represented by the following graph?



(a) ionization enthalpy (b) atomic radii

(c) enthalpy of atomization (d) melting point

For Visually Challenged Learners

12. Which of the following is not considered a transition element?

    (a) Scandium (b) Silver (c) Vanadium (d) Zinc

13. Given below are two statements labelled as Assertion (A) and Reason (R)

    Assertion (A): Alcohols react both as nucleophiles and electrophiles.

    Reason (R): The bond between C–O is broken when alcohols react as nucleophiles.

    Select the most appropriate answer from the options given below:

    (a) Both A and R are true and R is the correct explanation of A

    (b) Both A and R are true but R is not the correct explanation of A.

    (c) A is true but R is false.

    (d) A is false but R is true.

14. Given below are two statements labelled as Assertion (A) and Reason (R)

    Assertion (A): Strong oxidising agents oxidise toluene and its derivatives to benzoic acids.

    Reason (R): It is possible to stop the oxidation of toluene at the aldehyde stage with suitable reagents.

    Select the most appropriate answer from the options given below:

    (a) Both A and R are true and R is the correct explanation of A

    (b) Both A and R are true but R is not the correct explanation of A.

    (c) A is true but R is false.

    (d) A is false but R is true.

15. Given below are two statements labelled as Assertion (A) and Reason (R)

    Assertion (A): Enzymes are very specific for a particular reaction and for a particular substrate.

    Reason (R): Enzymes are biocatalysts.

    Select the most appropriate answer from the options given below:

    (a) Both A and R are true and R is the correct explanation of A

    (b) Both A and R are true but R is not the correct explanation of A.

    (c) A is true but R is false.

    (d) A is false but R is true.

16. Given below are two statements labelled as Assertion (A) and Reason (R)

    Assertion (A): During electrolysis of aqueous copper sulphate solution using copper electrodes hydrogen gas is released at the cathode.

    Reason (R): The electrode potential of Cu^{2+}/Cu is greater than that of H^{+}/H_2

    Select the most appropriate answer from the options given below:

    (a) Both A and R are true and R is the correct explanation of A

    (b) Both A and R are true but R is not the correct explanation of A.

    (c) A is true but R is false.

    (d) A is false but R is true.

SECTION B

This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.

17. a. Radioactive decay follows first - order kinetics. The initial amount of two radioactive elements X and Y is 1 gm each. What will be the ratio of X and Y after two days if their half-lives are 12 hours and 16 hours respectively?

    b. The hypothetical reaction P + Q $\longrightarrow$ R is half order w.r.t 'P' and zero order w.r.t 'Q'. What is the unit of rate constant for this reaction?

18. A 5% solution of $Na_2SO_4.10H_2O$ (MW = 3 22) is isotonic with 2% solution of non- electrolytic, non volatile substance X. Find out the molecular weight of X.

19. (a) Arrange the isomeric dichlorobenzene in the increasing order of their boiling point and melting points.

    (b) Explain why the electrophilic substitution reactions in haloarenes occur slowly and require more drastic conditions as compared to those in benzene.

20. (a) Out of p-tolualdehyde and p-nitrobenzaldehyde, which one is more reactive towards nucleophilic addition reactions, why?

    (b) Write the structure of the product formed when acetone reacts with 2,4 DNP reagent.

OR

Convert the following:

(a) Benzene to m-nitrobenzaldehyde

(b) Bromobenzene to benzoic acid

21. (a) DNA fingerprinting is used to determine paternity of an individual. Which property of DNA helps in the procedure?

    (b) What structural change will occur when a native protein is subjected to change in pH?

SECTION C

This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

22. (a) Write the formula for the following coordination compound

    Bis(ethane-1,2-diamine) dihydroxidochromium(III) chloride

    (b) Does ionization isomer for the following compound exist? Justify your answer.

    $Hg[Co(SCN)_4]$

    (c) Is the central metal atom in coordination complexes a Lewis acid or a Lewis base? Explain.

23. (a) Can we construct an electrochemical cell with two half-cells composed of $ZnSO_4$ solution and zinc electrodes? Explain your answer.

    (b) Calculate the λ^0_m for Cl^- ion from the data given below:

    $\Lambda^0_m\, MgCl_2 = 258.6\ Scm^2mol^{-1}$ and $\lambda^0_m\, Mg^{2+} = 106\ Scm^2mol^{-1}$

    (c) The cell constant of a conductivity cell is 0.146 cm^{-1}. What is the conductivity of 0.01 M solution of an electrolyte at 298 K, if the resistance of the cell is 1000 ohm?

24. Write the name of the reaction, structure and IUPAC name of the product formed when **(any 2)**:

(a) phenol reacts with $CHCl_3$ in the presence of NaOH followed by hydrolysis.

(b) $CH_3CH_2CH(CH_3)CH(CH_3)ONa$ reacts with C_2H_5Br

(c) CH_3CH_2CN reacts with stannous chloride in the presence of hydrochloric acid followed by hydrolysis

25. You are given four organic compounds "A", "B", "C" and "D". The compounds "A", "B" and "C" form an orange- red precipitate with 2,4 DNP reagent. Compounds "A" and "B" reduce Tollen's reagent while compounds "C" and "D" do not. Both "B" and "C" give a yellow precipitate when heated with iodine in the presence of NaOH. Compound "D" gives brisk effervescence with sodium bicarbonate solution. Identify "A", "B", "C" and "D" given the number of carbon atoms in three of these carbon compounds is three while one has two carbon atoms. Give an explanation for your answer.

26. When sucrose is hydrolysed the optical rotation values are measured using a polarimeter and are given in the following table:

S.No.	Time (hours)	Specific Rotation
1	0	$+66.5^o$
2	∞	-39.9^o

(a) Account for the two specific rotation values.

(b) What is the specific name given to sucrose based on the above observation?

(c) One of the products formed during the hydrolysis of sucrose is a glucose, that reacts with hydroxylamine to give compound A. Identify compound A.

27. An organic compound A with the molecular formula $(+)C_4H_9Br$ undergoes hydrolysis to form $(\pm)$ C_4H_9OH. Give the structure of A and write the mechanism of the reaction.

28. The rate constants of a reaction at 200K and 500K are $0.02s^{-1}$ and $0.20s^{-1}$ respectively. Calculate the value of Ea (Given $2.303R = 19.15\ JK^{-1}mol^{-1}$)

SECTION D

The following questions are case -based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow.

29. **Crystal field splitting by various ligands**

Metal complexes show different colours due to d-d transitions. The complex absorbs light of specific wavelength to promote the electron from t2g to eg level. The colour of the complex is due to the transmitted light, which is complementary of the colour absorbed.

The wave number of light absorbed by different complexes of Cr ion are given below:

Complex	Wavenumber of light absorbed (cm-1)	Energy of light absorbed(kJ/mol)
$[CrA_6]^{3-}$	13640	163
$[CrB_6]^{3+}$	17830	213
$[CrC_6]^{3+}$	21680	259
$[CrD_6]^{3-}$	26280	314

Answer the following questions:

(a) Out of the ligands "A", "B", "C" and "D", which ligand causes maximum crystal field splitting? Why?

OR

Which of the two, "A" or "D" will be a weak field ligand? Why?

(b) Which of the complexes will be violet in colour? $[CrA_6]^{3-}$ or $[CrB_6]^{3+}$ and why? (Given: If 560 – 570 nm of light is absorbed, the colour of the complex observed is violet.)

(c) If the ligands attached to Cr3+ ion in the complexes given in the table above are water, cyanide ion, chloride ion, and ammonia (not in this order)

Identify the ligand, write the formula and IUPAC name of the following:

(i) $[CrA_6]^{3-}$ (ii) $[CrC_6]^{3+}$

30. The lead-acid battery represents the oldest rechargeable battery technology. Lead acid batteries can be found in a wide variety of applications including small-scale power storage such as UPS systems, ignition power sources for automobiles, along with large, grid-scale power systems. The spongy lead act as the anode and lead dioxide as the cathode. Aqueous sulphuric acid is used as an electrolyte. The half-reactions during discharging of lead storage cells are:

Anode: $Pb(s) + SO_4^{2-}(aq) \rightarrow PbSO_4(s) + 2e^-$

Cathode: $PbO_2(s) + 4H^+(aq) + SO_4^{2-}(aq) + 2e^- \rightarrow PbSO_4(s) + 2H_2O$

There is no safe way of disposal and these batteries end - up in landfills. Lead and sulphuric acid are extremely hazardous and pollute soil, water as well as air. Irrespective of the environmental challenges it poses, lead-acid batteries have remained an important source of energy.

Designing green and sustainable battery systems as alternatives to conventional means remains relevant. Fuel cells are seen as the future source of energy. Hydrogen is considered a green fuel. Problem with fuel cells at present is the storage of hydrogen. Currently, ammonia and methanol are being used as a source of hydrogen for fuel cell. These are obtained industrially, so add to the environmental issues.

If the problem of storage of hydrogen is overcome, is it still a "green fuel?" Despite being the most abundant element in the Universe, hydrogen does not exist on its own so needs to be extracted from the water using electrolysis or separated from carbon fossil fuels. Both of these processes require a significant amount of energy which is currently more than that gained from the hydrogen itself. In addition, this extraction typically requires the use of fossil fuels. More research is being conducted in this field to solve these problems. Despite the problem of no good means to extract Hydrogen, it is a uniquely abundant and renewable source of energy, perfect for our future zero-carbon needs.

Answer the following questions:

(a) How many coulombs have been transferred from anode to cathode in order to consume one mole of sulphuric acid during the discharging of lead storage cell?

(b) How much work can be extracted by using lead storage cell if each cell delivers about 2.0 V of voltage? (1 F = 96500 C)

(c) Do you agree with the statement – "Hydrogen is a green fuel." Give your comments for and against this statement and justify your views.

OR

Imagine you are a member of an agency funding scientific research. Which of the following projects will you fund and why?

(i) safe recycling of lead batteries
(ii) extraction of hydrogen

SECTION E

The following questions are long answer type and carry 5 marks each. All questions have an internal choice.

31. Attempt **any five** of the following:

(a) Which of the following ions will have a magnetic moment value of 1.73 BM.

Sc^{3+}, Ti^{3+}, Ti^{2+}, Cu^{2+}, Zn^{2+}

(b) In order to protect iron from corrosion, which one will you prefer as a sacrificial electrode, Ni or Zn? Why? (Given standard electrode potentials of Ni, Fe and Zn are -0.25 V, -0.44 V and -0.76 V respectively.)

(c) The second ionization enthalpies of chromium and manganese are 1592 and 1509 kJ/mol respectively. Explain the lower value of Mn.

(d) Give two similarities in the properties of Sc and Zn.

(e) What is actinoid contraction? What causes actinoid contraction?

(f) What is the oxidation state of chromium in chromate ion and dichromate ion?

(g) Write the ionic equation for reaction of KI with acidified $KMnO_4$.

32. (a) What is the effect of temperature on the solubility of glucose in water?

(b) Ibrahim collected a 10mL each of fresh water and ocean water. He observed that one sample labeled "P" froze at 0 ^oC while the other "Q" at -1.3^oC. Ibrahim forgot which of the two, "P" or "Q" was ocean water. Help him identify which container contains ocean water, giving rationalization for your answer.

(c) Calculate Van't Hoff factor for an aqueous solution of $K_3[Fe(CN)_6]$ if the degree of dissociation (α) is 0.852. What will be boiling point of this solution if its concentration is 1 molal? (Kb=0.52 K kg/mol)

OR

(a) What type of deviation from Roult's Law is expected when phenol and aniline are mixed with each other? What change in the net volume of the mixture is expected? Graphically represent the deviation.

(b) The vapour pressure of pure water at a certain temperature is 23.80 mm Hg. If 1 mole of a non-volatile non- electrolytic solute is dissolved in 100g water, Calculate the resultant vapour pressure of the solution.

33. An organic compound with molecular formula $C_7H_7NO_2$ exists in three isomeric forms, the isomer 'A' has the highest melting point of the three. 'A' on reduction gives compound 'B' with molecular formula C_7H_9N. 'B' on treatment with $NaNO_2/HCl$ at 0-5 ^0C to form compound 'C'. On treating C with H_3PO_2 ,it gets converted to D with formula C_7H_8 , which on further reaction with CrO_2Cl_2 followed by hydrolysis forms 'E' C_7H_6O . Write the structure of compounds A to E . Write the chemical equations involved.

OR

(a) Account for the following:

(i) N-ethylbenzenesulphonyl amide is soluble in alkali .

(ii) Reduction of nitrobenzene using Fe and HCl is preferred over Sn and HCl.

(b) Arrange the following in:

(i) decreasing order of pK_b values

$C_6H_5NH_2$, $C_6H_5NHCH_3$, $C_6H_5CH_2NH_2$, CH_3NH_2, NH_3

(ii) increasing order of solubility in water

C_2H_5Cl, $C_2H_5NH_2$, C_2H_5OH

(iii) decreasing boiling point

CH_3COOH, C_2H_5OH, CH_3NH_2, CH_3OCH_3

SAMPLE QUESTION PAPER

Class:-XII

Session 2023-24

Mathematics (Code-041)

Time: 3 hours **Maximum marks: 80**

General Instructions:

1. This Question paper contains - five sections **A, B, C, D** and **E**. Each section is compulsory. However, there are internal choices in some questions.
2. **Section A** has 18 **MCQ's and 02** Assertion-Reason based questions of 1 mark each.
3. **Section B** has 5 **Very Short Answer (VSA)-type** questions of 2 marks each.
4. **Section C** has 6 **Short Answer (SA)-type** questions of 3 marks each.
5. **Section D** has 4 **Long Answer (LA)-type** questions of 5 marks each.
6. **Section E** has 3 **source based/case based/passage based/integrated units of assessment** of 4 marks each with sub-parts.

Section –A
(Multiple Choice Questions)

Each question carries 1 mark

Q1. If $A=\left[a_{ij}\right]$ is a square matrix of order 2 such that $a_{ij}=\begin{cases}1, \text{ when } i\neq j\\ 0, \text{ when } i=j\end{cases}$, then A^2 is

(a) $\begin{bmatrix}1 & 0\\ 1 & 0\end{bmatrix}_{2\times2}$ (b) $\begin{bmatrix}1 & 1\\ 0 & 0\end{bmatrix}_{2\times2}$ (c) $\begin{bmatrix}1 & 1\\ 1 & 0\end{bmatrix}_{2\times2}$ (d) $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}_{2\times2}$

Q2. If A and B are invertible square matrices of the same order, then which of the following is not correct?

(a) $\left|AB^{-1}\right|=\frac{|A|}{|B|}$ (b) $\left|(AB)^{-1}\right|=\frac{1}{|A|\ |B|}$

(c) $(AB)^{-1}=B^{-1}A^{-1}$ (d) $(A+B)^{-1}=B^{-1}+A^{-1}$

Q3. If the area of the triangle with vertices $(-3,0),(3,0)$ and $(0,k)$ is **9 sq units,** then the value/s of k will be

(a) 9 (b) ±3 (c) -9 (d) 6

Q4. If $f(x)=\begin{cases}\frac{kx}{|x|}, & \text{if } x<0\\ 3, & \text{if } x\geq0\end{cases}$ is continuous at $x=0$, then the value of k is

(a) -3 (b) 0 (c) 3 (d) any real number

Q5. The lines $\vec{r} = \hat{i} + \hat{j} - \hat{k} + \lambda\left(2\hat{i} + 3\hat{j} - 6\hat{k}\right)$ and $\vec{r} = 2\hat{i} - \hat{j} - \hat{k} + \mu\left(6\hat{i} + 9\hat{j} - 18\hat{k}\right)$; (where λ & μ are scalars) are

(a) coincident (b) skew (c) intersecting (d) parallel

Q6. The degree of the differential equation $\left[1 + \left(\frac{dy}{dx}\right)^2\right]^3 = \left(\frac{d^2y}{dx^2}\right)^2$ *is*

(a) 4 (b) $\frac{3}{2}$ (c) 2 (d) Not defined

Q7. The corner points of the bounded feasible region determined by a system of linear constraints are $(0,3), (1,1)$ and $(3,0)$. Let $Z = px + qy$, where p, $q > 0$. The condition on p and q so that the minimum of Z occurs at $(3,0)$ and $(1,1)$ is

(a) $p = 2q$ (b) $p = \frac{q}{2}$ (c) $p = 3q$ (d) $p = q$

Q8. $ABCD$ is a rhombus whose diagonals intersect at $\mathbf{E}$. Then $\overrightarrow{EA} + \overrightarrow{EB} + \overrightarrow{EC} + \overrightarrow{ED}$ equals to

(a) $\vec{0}$ (b) $\overrightarrow{AD}$ (c) $2\overrightarrow{BD}$ (d) $2\overrightarrow{AD}$

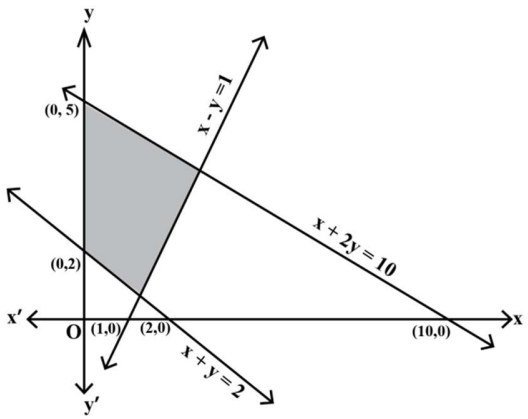
Q9. For any integer n, the value of $\int_{-\pi}^{\pi} e^{\cos^2 x} \sin^3(2n+1)x \, dx$ is

(a) -1 (b) 0 (c) 1 (d) 2

Q10. The value of $|A|$, **if** $A = \begin{bmatrix} 0 & 2x-1 & \sqrt{x} \\ 1-2x & 0 & 2\sqrt{x} \\ -\sqrt{x} & -2\sqrt{x} & 0 \end{bmatrix}$, **where** $x \in \mathbb{R}^+$, is

(a) $(2x+1)^2$ (b) 0 (c) $(2x+1)^3$ (d) $(2x-1)^2$

Q11. The feasible region corresponding to the linear constraints of a Linear Programming Problem is given below.



Which of the following is not a constraint to the given Linear Programming Problem?

(a) $x + y \geq 2$ (b) $x + 2y \leq 10$ (c) $x - y \geq 1$ (d) $x - y \leq 1$

Q12. If $\vec{a} = 4\hat{i} + 6\hat{j}$ and $\vec{b} = 3\hat{j} + 4\hat{k}$, then the vector form of the component of $\vec{a}$ along $\vec{b}$ is

(a) $\frac{18}{5}\left(3\hat{i} + 4\hat{k}\right)$ (b) $\frac{18}{25}\left(3\hat{j} + 4\hat{k}\right)$ (c) $\frac{18}{5}\left(3\hat{i} + 4\hat{k}\right)$ (d) $\frac{18}{25}\left(4\hat{i} + 6\hat{j}\right)$

Q13. Given that A is a square matrix of order 3 and $|A| = -2$, then $|adj(2A)|$ is equal to

(a) -2^6 (b) $+4$ (c) -2^8 (d) 2^8

Q14. A problem in Mathematics is given to three students whose chances of solving it are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ respectively. If the events of their solving the problem are independent then the probability that the problem will be solved, is

(a) $\frac{1}{4}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{3}{4}$

Q15. The general solution of the differential equation $ydx - xdy = 0; (\text{Given } x, y > 0)$, is of the form

(a) $xy = c$ (b) $x = cy^2$ (c) $y = cx$ (d) $y = cx^2$;

(Where 'c' is an arbitrary positive constant of integration)

Q16. The value of λ for which two vectors $2\hat{i} - \hat{j} + 2\hat{k}$ and $3\hat{i} + \lambda\hat{j} + \hat{k}$ are perpendicular is

(a) 2 (b) 4 (c) 6 (d) 8

Q17. The set of all points where the function $f(x) = x + |x|$ is differentiable, is

(a) $(0, \infty)$ (b) $(-\infty, 0)$ (c) $(-\infty, 0) \cup (0, \infty)$ (d) $(-\infty, \infty)$

Q18. If the direction cosines of a line are $< \frac{1}{c}, \frac{1}{c}, \frac{1}{c} >$, then

(a) $0 < c < 1$ (b) $c > 2$ (c) $c = \pm\sqrt{2}$ (d) $c = \pm\sqrt{3}$

ASSERTION-REASON BASED QUESTIONS

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).

(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).

(c) (A) is true but (R) is false.

(d) (A) is false but (R) is true.

Q19. Let $f(x)$ be a polynomial function of degree 6 such that $\frac{d}{dx}(f(x)) = (x-1)^3(x-3)^2$, then

ASSERTION (A): $f(x)$ has a minimum at $x = 1$.

REASON (R): When $\frac{d}{dx}(f(x)) < 0, \forall x \in (a-h, a)$ and $\frac{d}{dx}(f(x)) > 0, \forall x \in (a, a+h)$; where '$h$' is an infinitesimally small positive quantity, then $f(x)$ has a minimum at $x = a$, provided $f(x)$ is continuous at $x = a$.

Q20. ASSERTION (A): The relation $f:\{1,2,3,4\}\to\{x,y,z,p\}$ defined by $f=\{(1,x),(2,y),(3,z)\}$ is a bijective function.

REASON (R): The function $f:\{1,2,3\}\to\{x,y,z,p\}$ such that $f=\{(1,x),(2,y),(3,z)\}$ is one-one.

Section –B

[This section comprises of very short answer type questions (VSA) of 2 marks each]

Q21. Find the value of $\sin^{-1}\left(\cos\left(\frac{33\pi}{5}\right)\right)$.

OR

Find the domain of $\sin^{-1}\left(x^2-4\right)$.

Q22. Find the interval/s in which the function $f:\mathbb{R}\to\mathbb{R}$ defined by $f(x)=xe^x$, is increasing.

Q23. If $f(x)=\frac{1}{4x^2+2x+1};\ x\in\mathbb{R}$, then find the maximum value of $f(x)$.

OR

Find the maximum profit that a company can make, if the profit function is given by $P(x)=72+42x-x^2$, where x is the number of units and P is the profit in rupees.

Q24. Evaluate : $\int_{-1}^{1}\log\left(\frac{2-x}{2+x}\right)dx$.

Q25. Check whether the function $f:\mathbb{R}\to\mathbb{R}$ defined by $f(x)=x^3+x$, has any critical point/s or not ? If yes, then find the point/s.

Section – C

[This section comprises of short answer type questions (SA) of 3 marks each]

Q26. Find : $\int\frac{2x^2+3}{x^2\left(x^2+9\right)}dx;\quad x\neq 0$.

Q27. The random variable X has a probability distribution $P(X)$ of the following form, where 'k' is some real number:

$$P(X)=\begin{cases}k, & \text{if } x=0\\ 2k, & \text{if } x=1\\ 3k, & \text{if } x=2\\ 0, & \text{otherwise}\end{cases}$$

(i) Determine the value of k.

(ii) Find $P(X<2)$.

(iii) Find $P(X > 2)$.

Q28. Find : $\int \sqrt{\frac{x}{1-x^3}}\,dx; \quad x \in (0,1)$.

OR

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

Q29. Solve the differential equation: $ye^{\frac{x}{y}}\,dx = \left(xe^{\frac{x}{y}} + y^2\right)dy, \quad (y \neq 0)$.

OR

Solve the differential equation: $(\cos^2 x)\frac{dy}{dx} + y = \tan x; \quad \left(0 \le x < \frac{\pi}{2}\right)$.

Q30. Solve the following Linear Programming Problem graphically:

Minimize: $z = x + 2y$,

subject to the constraints: $x + 2y \ge 100,\ 2x - y \le 0,\ 2x + y \le 200,\ x, y \ge 0$.

OR

Solve the following Linear Programming Problem graphically:

Maximize: $z = -x + 2y$,

subject to the constraints: $x \ge 3, x + y \ge 5,\ x + 2y \ge 6, y \ge 0$.

Q31. If $(a+bx)e^{\frac{y}{x}} = x$ then prove that $x\frac{d^2y}{dx^2} = \left(\frac{a}{a+bx}\right)^2$.

Section –D

[This section comprises of long answer type questions (LA) of 5 marks each]

Q32. Make a rough sketch of the region $\{(x,y) : 0 \le y \le x^2 + 1,\ 0 \le y \le x + 1,\ 0 \le x \le 2\}$ and find the area of the region, using the method of integration.

Q33. Let $\mathbb{N}$ be the set of all natural numbers and R be a relation on $\mathbb{N} \times \mathbb{N}$ defined by $(a,b)\,R\,(c,d) \Leftrightarrow ad = bc$ for all $(a,b),(c,d) \in \mathbb{N} \times \mathbb{N}$. Show that R is an equivalence relation on $\mathbb{N} \times \mathbb{N}$. Also, find the equivalence class of $(2,6)$, i.e., $[(2,6)]$.

OR

Show that the function $f : \mathbb{R} \to \{x \in \mathbb{R} : -1 < x < 1\}$ defined by $f(x) = \frac{x}{1+|x|}, x \in \mathbb{R}$ is one-one and onto function.

Q34. Using the matrix method, solve the following system of linear equations :

$$\frac{2}{x}+\frac{3}{y}+\frac{10}{z}=4,\ \frac{4}{x}-\frac{6}{y}+\frac{5}{z}=1,\ \frac{6}{x}+\frac{9}{y}-\frac{20}{z}=2.$$

Q35. Find the coordinates of the image of the point $(1, 6, 3)$ with respect to the line $\vec{r}=\left(\hat{j}+2\hat{k}\right)+\lambda\left(\hat{i}+2\hat{j}+3\hat{k}\right)$; where '$\lambda$' is a scalar. Also, find the distance of the image from the $y-$ axis.

OR

An aeroplane is flying along the line $\vec{r}=\lambda\left(\hat{i}-\hat{j}+\hat{k}\right)$; where '$\lambda$' is a scalar and another aeroplane is flying along the line $\vec{r}=\hat{i}-\hat{j}+\mu\left(-2\hat{j}+\hat{k}\right)$; where '$\mu$' is a scalar. At what points on the lines should they reach, so that the distance between them is the shortest? Find the shortest possible distance between them.

Section –E

[This section comprises of 3 case- study/passage based questions of 4 marks each with sub parts. The first two case study questions have three sub parts (i), (ii), (iii) of marks 1,1,2 respectively. The third case study question has two sub parts of 2 marks each.)

Q36. Read the following passage and answer the questions given below:

In an Office three employees Jayant, Sonia and Oliver process incoming copies of a certain form. Jayant processes **50%** of the forms, Sonia processes **20%** and Oliver the remaining **30%** of the forms. Jayant has an error rate of **0.06** , Sonia has an error rate of **0.04** and Oliver has an error rate of **0.03** .

Based on the above information, answer the following questions.

(i) Find the probability that Sonia processed the form and committed an error.

(ii) Find the total probability of committing an error in processing the form.

(iii) The manager of the Company wants to do a quality check. During inspection, he selects a form at random from the days output of processed form. If the form selected at random has an error, find the probability that the form is **not** processed by Jayant.

OR

(iii) Let E be the event of committing an error in processing the form and let E_1, E_2 and E_3 be the events that Jayant, Sonia and Oliver processed the form. Find the value of $\sum_{i=1}^{3} P(E_i|E)$.

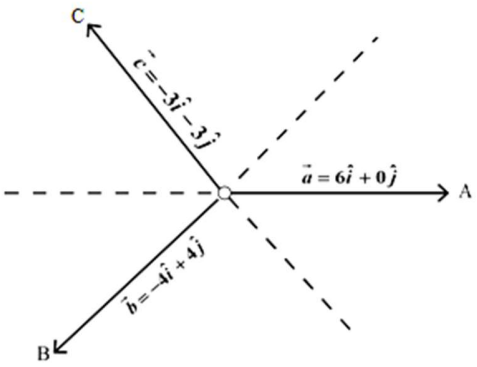
Q37. Read the following passage and answer the questions given below:

Teams A, B, C went for playing a tug of war game. Teams A, B, C have attached a rope to a metal ring and is trying to pull the ring into their own area.

Team A pulls with force $F_1 = 6\hat{i} + 0\hat{j}\ kN$,

Team B pulls with force $F_2 = -4\hat{i} + 4\hat{j}\ kN$,

Team C pulls with force $F_3 = -3\hat{i} - 3\hat{j}\ kN$,



(i) What is the magnitude of the force of Team A ?

(ii) Which team will win the game?

(iii) Find the magnitude of the resultant force exerted by the teams.

OR

(iii) In what direction is the ring getting pulled?

Q38. Read the following passage and answer the questions given below:

The relation between the height of the plant $('y' \text{ in cm})$ with respect to its exposure to the sunlight is governed by the following equation $y = 4x - \frac{1}{2}x^2$, where $'x'$ is the number of days exposed to the sunlight, for $x \leq 3$.

(i) Find the rate of growth of the plant with respect to the number of days exposed to the sunlight.

(ii) Does the rate of growth of the plant increase or decrease in the first three days?

What will be the height of the plant after 2 days?

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Sample Question Paper
Applied Mathematics (Code-241)
Class XII
2023-24

Time Allowed: 3 Hours **Maximum Marks: 80**

General Instructions :

1. This Question paper contains - **five sections** A,B,C,D and E. Each section is compulsory. However, there is some internal choice in some questions.
2. **Section A** has 18 **MCQ's and 02** Assertion Reason based questions of 1 mark each.
3. **Section B** has 5 **Very Short Answer(VSA)** questions of 2 marks each.
4. **Section C** has 6 **Short Answer(SA)** questions of 3 marks each.
5. **Section D** has 4 **Long Answer(LA)** questions of 5 marks each.
6. **Section E** has 3 **source based/case based/passage based/integrated units of assessment (**04 marks each**)** with sub parts.
7. Internal Choice is provided **in 2 questions in Section-B, 2 questions in Section-C, 2 Questions in Section-D.** You have to attempt only one alternatives in all such questions.

SECTION A
(All Questions are compulsory. No internal choice is provided in this section)

Q -1 The value of -70 mod 13 is
(a) 5 (b) -5 (c) 8 (d)-8

Q -2 If $\frac{x+1}{x+2} \geq 1$, then
(a) $x \in [-\infty, 2]$ (b) $x \in (-\infty, -2)$ (c) $x \in (-\infty, 2]$ (d) $x \in (-\infty, 2)$

Q-3 Which of the following is a statistic
(a) μ (b) $\bar{x}$ (c) σ^2 (d) None

Q-4 In one sample t- test, the estimation for population mean is
(a) $\frac{\bar{x}-\mu}{\frac{s}{\sqrt{n}}}$ (b) $\frac{\bar{x}-\mu}{s/n}$ (c) $\frac{\bar{x}-\mu}{s^2/n}$ (d) $\frac{\overline{x_1}-\overline{x_2}}{\frac{s}{\sqrt{n}}}$

Q-5 A man can row 6 km/h in still water. It takes him twice as long to row up as to row down the river. Then the rate of the stream is
(a) 2 km/h (b) 4 km/h (c) 6 km/h (d) 8 km/h

Q-6 If random variable X represents the number of heads when a coin is tossed twice then mathematical expectation of X is
(a) 0 (b) $\frac{1}{4}$ (c) $\frac{1}{2}$ (d) 1

Q-7 The least non-negative remainder when 3^{50} is divided by 7 is
(a) 4 (b) 3 c) 2 d) 1

Q-8 If the cash equivalent of a perpetuity of Rs ₹300 payable at the end of each quarter is ₹24000 then rate of interest compounded quarterly is
(a) 5% (b) 4% (c) 3% (d) 2%

Q-9 $\int \frac{logx}{x} dx$ equals

(a) $\frac{logx}{2} + C$ (b) $\frac{(logx)^2}{2}$ +C (c) $logx$ + C (d)) $log\ (log\ x)$ + C

Q-10 The supply of finished good was delayed for a month due to landslide in hilly terrain. Under which trend oscillation does this situation fall

(a) $Seasonal$ (b) $Cyclical$ (c) $Secular$ (d) $Irregular$

Q-11 A machine costing ₹ 30,000 is expected to have a useful life of 4 years and a final scrap value of ₹ 4000. The annual depreciation is

(a) ₹ 5500 (b) ₹ 6500 (c) ₹ 7500 (d) ₹ 8500

Q-12 The effective rate of interest equivalent to the nominal rate 6% compounded semi-annually is

(a) 6.05% (b) 6.07% (c) 6.09% (d) 6.1%

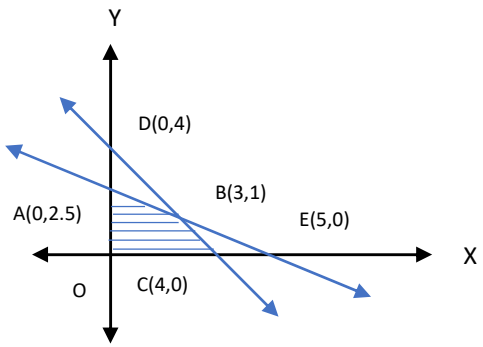
Q-13 If the investment of ₹ 20000 in the mutual fund in 2015 increased to ₹ 32000 in year 2020, then CAGR (Compound Annual Growth rate is) is [Given$(1.6)^{\frac{1}{5}} = 1.098$]

(a) 9.08% (b) 9.8% (c) 0.098 (d) 0.09

Q-14 The integrating factor of the differential equation $x\frac{dy}{dx} + 2y = x^3\ \ (x \neq 0)$ is

(a) x (b) $logx$ (c) x^2 (d) $\frac{1}{x^2}$

Q-15 Besides non negativity constraint the figure given below is subject to which of the following constraints



(a) $x + 2y \leq 5\ ; x + y \leq 4$ (b) $x + 2y \geq 5\ ; x + y \leq 4$

(c) $x + 2y \geq 5\ ; x + y \geq 4$ (d) $x + 2y \leq 5\ ; x + y \geq 4$

Q-16 If X is a Poisson variate such that 3P(X=2) = 2P(X=1) then the mean of the distribution is equal to

(a) $\frac{4}{3}$ (b) $\frac{3}{4}$ (c) $-\frac{4}{3}$ (d) $-\frac{3}{4}$

Q-17 For the given five values 35, 70, 36, 59, 64, the three years moving averages are given by

$(a) 47, 53, 55$ (b) $53, 47, 45$ (c) $47, 55, 53$ (d) 45, 55, 57

Q-18 The data point of a normal variate with mean 12, standard deviation 4 and Z – score 5 is

(a) 28 (b) 304 (c) 34 (d) 32

ASSERTION REASON BASED QUESTIONS

In the following questions, a statement of Assertion(A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices

a. Both A and R are true and R is the correct explanation of A.
b. Both A and R are true and R is not the correct explanation of A.
c. A is true but R is false.
d. A is false but R is true.

Q-19 Assertion (A): The maximum profit that a company makes if profit function is given by $P(x) = 41 + 24x - 8x^2$; where 'x' is the number of units and P is the profit is ₹59

Reason (R) : The profit is maximum at x = a if $P'(a) = 0$ *and* $P''(a) > 0$

Q-20 Assertion (A) : The probability of getting 6 heads when a unbiased coin is tossed 10 times is $C(10,6)\left(\frac{1}{2}\right)^{10}$

Reason (R) In a Binomial distribution the probability is given by
$P(X= r) = C(n, r)(p)^r(q)^{n-r}$

SECTION B

All Questions are compulsory. In case of internal Choice, attempt any one question only

Q-21 At what rate of interest will the present value of perpetuity of ₹1500 payable at the end of every 6 months be ₹20,000?

Q-22 If A is a square matrix $\begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix}$ such that$A^2 = pA$, then find the value of p.

OR

If $\begin{bmatrix} 0 & a & 3 \\ 2 & b & -1 \\ c & 1 & 0 \end{bmatrix}$ is skew -symmetric matrix, then find value of $a+b+c$

Q-23 A Cooperative Society of farmers has 10 hectares of land to grow two crops A and B. To control weeds, pesticide has to be used for crops A and B at the rate of 30 grams per hectare and 15 grams per hectare respectively. Further, not more than 750 grams of pesticide should be used. The profit from crops A and B per hectare are estimated as ₹8000 and ₹9500. Formulate the above problem as LPP, in order to allocate land to each crop for maximum total profit.

Q-24 A man rows 15km upstream and 25km downstream each in 5 hours. Find he speed of the stream.

OR

'A' can run 40 meters while 'B' runs 50 meters in the same time. In a 1000 m race, find by how much distance 'B' beats 'A'.

Q-25 A machine produces washers of thickness 0.50mm. To determine whether the machine is in proper working order, a sample of 10 washers is chosen for which the mean thickness is 0.53mm and the standard deviation is 0.03mm. Test the hypothesis at 5% level of significance that the machine is working in proper order.
[Given $t_{9(0.05)} = 2.262$]

SECTION C

All Questions are compulsory. In case of internal Choice, attempt any one question only

Q-26 Find: $\int \frac{x^3}{(x+2)}\,dx$

OR

Find: $\int (x^2+1)\,log\,x\;\,dx$

Q-27 Cost of two toys A and B are ₹50 and ₹75. On a particular Sunday shopkeeper P sells 7 toys of type A and 10 toys of type B whereas shopkeeper Q sells 8 toys of type A and 6 toys of type B. Find income of both shopkeepers using matrix Algebra.

Q-28 Find the intervals in which the function f(x) = $2x^3 - 9x^2 + 12x - 5$ is increasing or decreasing.

Q-29 The demand and supply functions under the pure market competition are $p_d = 16 - x^2$ and $p_s = 2x^2 + 4$ respectively, where p is the price and x is the quantity of the commodity. Using integrals find **Consumer's surplus**.

OR

The demand and supply functions under the pure market competition are $p_d = 56 - x^2$ and $p_s = 8 + \frac{x^2}{3}$ respectively, where p is the price and x is the quantity of the commodity. Using integrals find **Producer's surplus.**

Q-30 Mr Surya borrowed a sum of ₹5,00,000 with total interest to be paid ₹2,00,000(flat) and he is paying an EMI of ₹12,500. Calculate loan tenure.

Q-31 Mr Sharma wants to send his daughter abroad for higher studies after 10 years. He sets up a sinking fund in order to have ₹500,000 after 10 years. How much should he set aside semi-annually into an account paying 5% per annum compounded annually.
[Use $(1.025)^{20}$= 1.6386]

SECTION D

(This section comprises of long answer type questions (LA) of 5 mark each)

Q-32 On doing the proof reading of a book on an average 4 errors in 10 pages were detected. Using Poisson's distribution find the probability of (i) No error and (ii) one error in 1000 pages of first printed edition of the book (Given $e^{-0.4}$ = 0.6703)

OR

How many times Sunil toss a fair coin so that the probability of getting at least one head is more than 90 %

Q-33 A manufacturer has three machines I,II and III installed in his factory. Machines I and II are capable of being operated for at most 12 hours whereas machine III must be operated for at least 5 hours a day. He produces only two items M and N , each requiring the use of all the three machines. The number of hours required for producing 1 unit of M and N on three machines are given in the following table:

Items	Number of hours required on machines		
	I	II	III
M	1	2	1
N	2	1	1.25

He makes a profit of ₹600 and ₹400 on one unit of items M and N respectively. Formulate the above problem as LPP and solve it graphically to find how many units of each item be produced to maximize profit. Also find the maximum profit.

Q-34 A company produces a certain commodity with ₹2400 fixed cost. The variable cost is estimated to be 25% of the total revenue received on selling the product at a rate of ₹8 per unit. Find the following

(i) Cost Function. (ii) Revenue Function

(iii) Breakeven Point (iv) Profit Function

OR

The production manager of a company plans to include 180 sq cm of actual printed matter in each page of a book under production. Each page should have a 2.5 cm wide margin along the top and bottom and 2 cm wide margin along the sides. What are the most economical dimensions of each printed page?

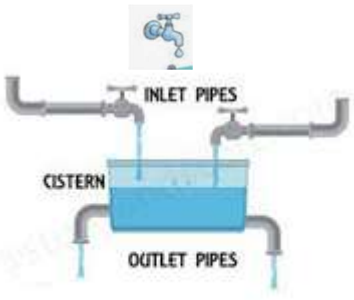
Q-35 The management committee of a Welfare Club decided to award some of its members (say x) for sincerity, some (say y) for helping others selflessly and some others (say z) for effective management. The sum of all the awardees is 12. Three times the sum of all awardees for helping others selflessly and effective management added to two times the number of awardees for sincerity is 33. If the sum of the number of awardees for sincerity and effective management is twice the number of awardees for helping others, use matrix method to find the number of awardees of each category.

SECTION E

(This section comprises of 3 source based questions (Case Studies) of 4 mark each)

Q-36 Case Study 1 : Pipes and Cisterns (Mark 2+1+1) (Internal choice is in the iii part)

A, B and C are three pipes connected to a tank. A and B together fill the tank in 6 hours. B and C together fill the tank in 10 hours. A and C together fill the tank in $7\frac{1}{2}\ hours$. Based on above information answer the following questions.



(i) In how much time will A, B and C fill the tank?

(ii) In how much time will A separately fill the tank?

(iii) In how much time will B separately fill the tank?

OR

In how much time will C separately fill the tank?

Q-37 Case Study 2: Read the following passage and answer the questions given below (**Internal Choice is in option iii**.) (Mark 1 + 1 + 2)

Let X denote the number of hours a person watches television during a randomly selected day. The probability that X can take the values x_i, has the following form, where 'k' is some unknown constant.

$$P(X = x_i) = \begin{cases} 0.2, & \text{if } x_i = 0 \\ kx_i, & \text{if } x_i = 1 \text{ or } 2 \\ k(5 - x_i), & \text{if } x_i = 3 \\ 0, & otherwise \end{cases}$$

(i) Find the value of k.

(ii) What is the probability that a person watches two hours of television on a selected day?

(iii) What is the probability that the person watches at least two hours of television on a selected day ?

OR

(iv) What is the probability that the person watches at most two hours of television on a selected day ?

Q-38 Case Study 3 :

When observed over a long period of time, a time series data can predict trend that can forecast increase or decrease or stagnation of a variable under consideration. Such analytical studies can benefit a business for forecasting or prediction of future estimated sales or production

The table below shows the welfare expenses(in lakh ₹) of Steel Industry during 2001-2005. Fit a straight line trend by the method of least squares and estimate the trend for the year 2008.

Year	2001	2002	2003	2004	2005
Welfare expenses	160	185	220	300	510

OR

The annual rainfall(in mm) was recorded in Cherrapunji, Meghalaya

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009
Rainfall(in mm)	1.2	1.9	2	1.4	2.1	1.3	1.8	1.1	1.3

Determine the trend of rainfall by three years moving average and draw the moving averages graph.

Class: XII Session: 2023-24

Computer Science (083)

Sample Question Paper (Theory)

Time allowed: 3 Hours **Maximum Marks: 70**

General Instructions:

- **Please check this question paper contains 35 questions.**
- **The paper is divided into 4 Sections- A, B, C, D and E.**
- **Section A, consists of 18 questions (1 to 18). Each question carries 1 Mark.**
- **Section B, consists of 7 questions (19 to 25). Each question carries 2 Marks.**
- **Section C, consists of 5 questions (26 to 30). Each question carries 3 Marks.**
- **Section D, consists of 2 questions (31 to 32). Each question carries 4 Marks.**
- **Section E, consists of 3 questions (33 to 35). Each question carries 5 Marks.**
- **All programming questions are to be answered using Python Language only.**

Ques No	Question	Marks
	SECTION A	
1	State True or False: "In a Python program, if a `break` statement is given in a nested loop, it terminates the execution of all loops in one go."	1
2	In a table in MYSQL database, an attribute `A` of datatype `varchar(20)` has the value "`Keshav`". The attribute `B` of datatype `char(20)` has value "`Meenakshi`". How many characters are occupied by attribute `A` and attribute `B`? a. 20,6 b. 6,20 c. 9,6 d. 6,9	1
3	What will be the output of the following statement: `print(3-2**2**3+99/11)` a. 244 b. 244.0 c. -244.0 d. Error	1
4	Select the correct output of the code:	1

| | ```
s = "Python is fun"
l = s.split()
s_new = "-".join([l[0].upper(), l[1], l[2].capitalize()])
print(s_new)
```<br>Options:<br>a. PYTHON-IS-Fun<br>b. PYTHON-is-Fun<br>c. Python-is-fun<br>d. PYTHON-Is -Fun | |
5	In MYSQL database, if a table, **Alpha** has degree 5 and cardinality 3, and another table, **Beta** has degree 3 and cardinality 5, what will be the degree and cardinality of the Cartesian product of **Alpha** and **Beta**? a. 5,3 b. 8,15 c. 3,5 d. 15,8	1
6	Riya wants to transfer pictures from her mobile phone to her laptop. She uses Bluetooth Technology to connect two devices. Which type of network will be formed in this case? a. PAN b. LAN c. MAN d. WAN	1
7	Which of the following will delete key-value pair for key = "Red" from a dictionary D1? a. delete D1("Red") b. del D1["Red"] c. del.D1["Red"] d. D1.del["Red"]	1
8	Consider the statements given below and then choose the correct output from the given options: pride="#G20 Presidency" print(pride[-2:2:-2])	1
```

	Options: a. ndsr b. ceieP0 c. ceieP d. yndsr	

9	Which of the following statement(s) would give an error during execution of the following code?
	`tup = (20,30,40,50,80,79)`
	`print(tup)  #Statement 1`
	`print(tup[3]+50)  #Statement 2`
	`print(max(tup))  #Statement 3`
	`tup[4]=80  #Statement 4`
	
	Options:
	a. Statement 1
	b. Statement 2
	c. Statement 3
	d. Statement 4
		1

10	What possible outputs(s) will be obtained when the following code is executed?
	`import random`
	`myNumber=random.randint(0,3)`
	`COLOR=["YELLOW","WHITE","BLACK","RED"]`
	`for I in range(1,myNumber):`
	`  print(COLOR[I],end="*")`
	`  print()`
	
	Options:
	a.
		1

	RED* WHITE* BLACK* b. WHITE* BLACK* c. WHITE* WHITE* BLACK* BLACK* d. YELLOW* WHITE*WHITE* BLACK* BLACK* BLACK*	
11	Fill in the blank: The modem at the sender's computer end acts as a _____. a. Model b. Modulator c. Demodulator d. Convertor	1

12	Consider the code given below:
	`b=100`
	`def test(a):`
	`    _____  # missing statement`
	`    b=b+a`
	`    print(a,b)`
	`test(10)`
	`print(b)`
		1

	Which of the following statements should be given in the blank for #Missing Statement, if the output produced is 110? Options: a. `global a` b. `global b=100` c. `global b` d. `global a=100`	
13	State whether the following statement is True or False: An exception may be raised even if the program is syntactically correct.	1
14	Which of the following statements is FALSE about keys in a relational database? a. Any candidate key is eligible to become a primary key. b. A primary key uniquely identifies the tuples in a relation. c. A candidate key that is not a primary key is a foreign key. d. A foreign key is an attribute whose value is derived from the primary key of another relation.	1
15	Fill in the blank: In case of _____ switching, before a communication starts, a dedicated path is identified between the sender and the receiver.	1

16	Which of the following functions changes the position of file pointer and returns its new position?
	`a.flush()`
	`b.tell()`
	`c.seek()`
	`d.offset()`
		1

	Q17 and 18 are ASSERTION AND REASONING based questions. Mark the correct choice as (a) Both A and R are true and R is the correct explanation for A (b) Both A and R are true and R is not the correct explanation for A	

	(c) A is True but R is False (d) A is false but R is True	
17	Assertion(A): List is an immutable data type Reasoning(R): When an attempt is made to update the value of an immutable variable, the old variable is destroyed and a new variable is created by the same name in memory.	1
18	Assertion(A): Python Standard Library consists of various modules. Reasoning(R): A function in a module is used to simplify the code and avoids repetition.	1
	SECTION B	
19	(i) Expand the following terms: POP3 , URL (ii) Give one difference between XML and HTML. OR (i) Define the term bandwidth with respect to networks. (ii) How is http different from https?	1+1=2

20	The code given below accepts a number as an argument and returns the reverse number. Observe the following code carefully and rewrite it after removing **all syntax and logical errors**. Underline all the corrections made.
	`define revNumber(num):`
	`  rev = 0`
	`  rem = 0`
	`  While num > 0:`
	`  rem ==num %10`
	`  rev = rev*10 + rem`
	`  num = num//10`
	`  return rev`
	`print(revNumber(1234))`
		2

21	Write a function `countNow(PLACES)` in Python, that takes the dictionary, `PLACES` as an argument and displays the names (in uppercase)of the places whose names are longer than 5 characters. For example, Consider the following dictionary `PLACES={1:"Delhi",2:"London",3:"Paris",4:"New York",5:"Doha"}` The output should be: LONDON NEW YORK OR Write a function, `lenWords(STRING)`, that takes a string as an argument and returns a tuple containing length of each word of a string. For example, if the string is `"Come let us have some fun"`, the tuple will have `(4, 3, 2, 4, 4, 3)`	2

22	Predict the output of the following code:
	`S = "LOST"`
	`L = [10,21,33,4]`
	`D={}`
	`for I in range(len(S)):`
	`  if I%2==0:`
	`  D[L.pop()] = S[I]`
	`  else:`
	`  D[L.pop()] = I+3`
	`for K,V in D.items():`
	`  print(K,V,sep="*")`
		2

23	Write the Python statement for **each** of the following tasks using BUILT-IN functions/methods only: (i) To insert an element `200` at the third position, in the list `L1`. (ii) To check whether a string named, `message` ends with a full stop / period or not.	1+1=2

	OR A list named `studentAge` stores age of students of a class. Write the Python command to import the required module and (using built-in function) to display the most common age value from the given list.	
24	Ms. Shalini has just created a table named "`Employee`" containing columns `Ename, Department` and `Salary.` After creating the table, she realized that she has forgotten to add a primary key column in the table. Help her in writing an SQL command to add a primary key column `EmpId` of integer type to the table `Employee`. Thereafter, write the command to insert the following record in the table: `EmpId`- 999 `Ename`- Shweta `Department`: Production `Salary`: 26900 OR Zack is working in a database named `SPORT,` in which he has created a table named "`Sports`" containing columns `SportId, SportName, no_of_players,` and `category.` After creating the table, he realized that the attribute, `category` has to be deleted from the table and a new attribute `TypeSport` of data type string has to be added. This attribute `TypeSport` cannot be left blank. Help Zack write the commands to complete both the tasks.	2
25	Predict the output of the following code:	2

```
def Changer(P,Q=10):
    P=P/Q
    Q=P%Q
    return P

A=200
B=20
A=Changer(A,B)
print(A,B, sep='$')
B=Changer(B)
print(A,B, sep='$', end='###')
```

SECTION C

26 Predict the output of the Python code given below: 3

```
Text1="IND-23"
Text2=""
I=0
while I<len(Text1):
    if Text1[I]>="0" and Text1[I]<="9":
        Val = int(Text1[I])
        Val = Val + 1
        Text2=Text2 + str(Val)
    elif Text1[I]>="A" and Text1[I]<="Z":
        Text2=Text2 + (Text1[I+1])
    else:
        Text2=Text2 + "*"
    I+=1
print(Text2)
```

27 Consider the table CLUB given below and write the output of the SQL queries that follow. 1*3= 3

CID	CNAME	AGE	GENDER	SPORTS	PAY	DOAPP
5246	AMRITA	35	FEMALE	CHESS	900	2006-03-27

4687	SHYAM	37	MALE	CRICKET	1300	2004-04-15	
1245	MEENA	23	FEMALE	VOLLEYBALL	1000	2007-06-18	
1622	AMRIT	28	MALE	KARATE	1000	2007-09-05	
1256	AMINA	36	FEMALE	CHESS	1100	2003-08-15	
1720	MANJU	33	FEMALE	KARATE	1250	2004-04-10	
2321	VIRAT	35	MALE	CRICKET	1050	2005-04-30	

(i) `SELECT COUNT(DISTINCT SPORTS) FROM CLUB;`

(ii)
```
SELECT CNAME, SPORTS FROM CLUB WHERE
DOAPP<"2006-04-30" AND CNAME LIKE "%NA";
```

(iii)
```
SELECT CNAME, AGE, PAY FROM CLUB WHERE
GENDER = "MALE" AND PAY BETWEEN 1000 AND
1200;
```

28 Write a function in Python to read a text file, `Alpha.txt` and displays those lines which begin with the word '`You`'. — 3

OR

Write a function, `vowelCount()` in Python that counts and displays the number of vowels in the text file named `Poem.txt`.

29 Consider the table `Personal` given below: — 1*3=3

`Table: Personal`

P_ID	Name	Desig	Salary	Allowance
P01	Rohit	Manager	89000	4800

	P02	Kashish	Clerk	NULL	1600
	P03	Mahesh	Superviser	48000	NULL
	P04	Salil	Clerk	31000	1900
	P05	Ravina	Superviser	NULL	2100

Based on the given table, write SQL queries for the following:

(i) Increase the salary by 5% of personals whose allowance is known.

(ii) Display Name and Total Salary (sum of Salary and Allowance) of all personals. The column heading 'Total Salary' should also be displayed.

(iii) Delete the record of personals who have salary greater than 25000

30 A list, `NList` contains following record as list elements: 3

`[City, Country, distance from Delhi]`

Each of these records are nested together to form a nested list. Write the following user defined functions in Python to perform the specified operations on the stack named `travel`.

(i) **`Push_element(NList):`** It takes the nested list as an argument and pushes a list object containing name of the city and country, which are not in India and distance is less than 3500 km from Delhi.

(ii) **Pop_element():** It pops the objects from the stack and displays them. Also, the function should display "Stack Empty" when there are no elements in the stack.

For example: If the nested list contains the following data:

```
NList=[["New York", "U.S.A.", 11734],
["Naypyidaw", "Myanmar", 3219],
["Dubai", "UAE", 2194],
["London", "England", 6693],
```

```
["Gangtok", "India", 1580],
["Columbo", "Sri Lanka", 3405]]
```

The stack should contain:

```
['Naypyidaw', 'Myanmar'],
['Dubai', 'UAE'],
['Columbo', 'Sri Lanka']
```

The output should be:

```
['Columbo', 'Sri Lanka']
['Dubai', 'UAE']
['Naypyidaw', 'Myanmar']
Stack Empty
```

SECTION D

31 Consider the tables PRODUCT and BRAND given below: 1*4= 4

Table: PRODUCT

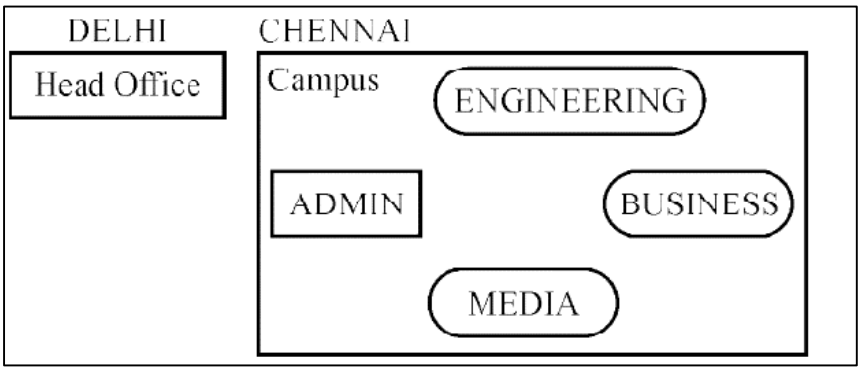
PCode	PName	UPrice	Rating	BID
P01	Shampoo	120	6	M03
P02	Toothpaste	54	8	M02
P03	Soap	25	7	M03
P04	Toothpaste	65	4	M04
P05	Soap	38	5	M05
P06	Shampoo	245	6	M05

Table: BRAND

BID	BName
M02	Dant Kanti
M03	Medimix
M04	Pepsodent
M05	Dove

	Write SQL queries for the following: (i) Display product name and brand name from the tables PRODUCT and BRAND. (ii) Display the structure of the table PRODUCT. (iii) Display the average rating of Medimix and Dove brands (iv) Display the name, price, and rating of products in descending order of rating.	
32	Vedansh is a Python programmer working in a school. For the Annual Sports Event, he has created a csv file named `Result.csv`, to store the results of students in different sports events. The structure of `Result.csv` is : `[St_Id, St_Name, Game_Name, Result]` Where `St_Id` is Student ID (integer) `ST_name` is Student Name (string) `Game_Name` is name of game in which student is participating(string) Result is result of the game whose value can be either `'Won', 'Lost'` or `'Tie'` For efficiently maintaining data of the event, Vedansh wants to write the following user defined functions: `Accept()` – to accept a record from the user and add it to the file `Result.csv`. The column headings should also be added on top of the csv file. `wonCount()` – to count the number of students who have won any event. As a Python expert, help him complete the task.	4
	SECTION E	

33	Meticulous EduServe is an educational organization. It is planning to setup its India campus at Chennai with its head office at Delhi. The Chennai campus has 4 main buildings – ADMIN, ENGINEERING, BUSINESS and MEDIA	1*5= 5



Block to Block distances (in Mtrs.)

From	To	Distance
ADMIN	ENGINEERING	55 m
ADMIN	BUSINESS	90 m
ADMIN	MEDIA	50 m
ENGINEERING	BUSINESS	55 m
ENGINEERING	MEDIA	50 m
BUSINESS	MEDIA	45 m
DELHI HEAD OFFICE	CHENNAI CAMPUS	2175 km

Number of computers in each of the blocks/Center is as follows:

ADMIN	110
ENGINEERING	75
BUSINESS	40
MEDIA	12
DELHI HEAD	20

a) Suggest and draw the cable layout to efficiently connect various blocks of buildings within the CHENNAI campus for connecting the digital devices.

	b) Which network device will be used to connect computers in each block to form a local area network? c) Which block, in Chennai Campus should be made the server? Justify your answer. d) Which fast and very effective wireless transmission medium should preferably be used to connect the head office at DELHI with the campus in CHENNAI? e) Is there a requirement of a repeater in the given cable layout? Why/ Why not?	

34	(i) Differentiate between r+ and w+ file modes in Python.
	(ii) Consider a file, `SPORT.DAT`, containing records of the following structure:
	`[SportName, TeamName, No_Players]`
	Write a function, `copyData()`, that reads contents from the file `SPORT.DAT` and copies the records with Sport name as "**`Basket Ball`**" to the file named `BASKET.DAT`. The function should return the total number of records copied to the file `BASKET.DAT`.
	OR
	(i) How are text files different from binary files?
	(ii) A Binary file, `CINEMA.DAT` has the following structure:
	`{MNO:[MNAME, MTYPE]}`
	Where
	`MNO` – Movie Number
	`MNAME` – Movie Name
	`MTYPE` is Movie Type
	Write a user defined function, `findType(mtype)`, that accepts `mtype` as parameter and displays all the records from the binary file `CINEMA.DAT`, that have the value of Movie Type as `mtype`.
		2+3=5

35	(i) Define the term Domain with respect to RDBMS. Give one example to support your answer.	1+4=5

(ii) Kabir wants to write a program in Python to insert the following record in the table named `Student` in MYSQL database, `SCHOOL`:

- `rno`(Roll number)- integer
- `name`(Name) - string
- `DOB` (Date of birth) – Date
- `Fee` – float

Note the following to establish connectivity between Python and MySQL:

- Username - `root`
- Password - `tiger`
- Host - `localhost`

The values of fields `rno, name, DOB` and `fee` has to be accepted from the user. Help Kabir to write the program in Python.

OR

(i) Give one difference between alternate key and candidate key.

(ii) Sartaj has created a table named `Student` in MYSQL database, `SCHOOL`:

- `rno`(Roll number)- integer
- `name`(Name) - string
- `DOB` (Date of birth) – Date
- `Fee` – float

Note the following to establish connectivity between Python and MySQL:

- Username - `root`
- Password - `tiger`
- Host - `localhost`

	Sartaj, now wants to display the records of students whose fee is more than 5000. Help Sartaj to write the program in Python.	