

Mock Advanced Test-11 Paper-1

TIME : 3 hrs

M.M. : 189

Read the following Instructions very carefully before you proceed.

- The question paper consists of 3 Subjects (Subject I: Physics, Subject II: Chemistry, Subject III: Mathematics). Each Subject consists of 2 sections (Section I and Section II).
- Section I** contains three types of questions (Type 1, Type 2 & Type 3).

Type 1 contains **5 Multiple Choice Questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE** is correct.

➤ *Marking scheme* [3 marks if you darken the bubble corresponding to the correct answer **ONLY** and zero marks if no bubbles are darkened. In all other cases, minus one (-1) mark will be awarded]

Type 2 contains **4 Multiple Choice Questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE or MORE** are correct.

➤ *Marking scheme* [4 marks if you darken all the bubble(s) corresponding to the correct answer(s) **ONLY**. In all other cases zero (0) marks will be awarded. No negative marks will be awarded for incorrect answers]

Type 3 contains **2 paragraphs** each describing theory, experiment and data etc. Four questions relate to two paragraphs with two questions on each paragraph. Each question pertaining to a particular passage should have **Only ONE Correct Answer** among the four given choices (A), (B), (C) & (D).

➤ *Marking scheme* [3 Marks for All Correct answers and zero mark if no bubbles are darkened. In all other cases, minus one (-1) mark will be awarded]
- Section II** contains **5 Questions**. The answer to each question is a **Single Digit Integer**, ranging from 0 to 9 (both inclusive).

➤ *Marking scheme* [4 marks if you darken all the bubble corresponding to the correct answer **ONLY**. In all other cases zero (0) marks will be awarded. No negative marks will be awarded for incorrect answer]
- For answering a question, an ANSWER SHEET (OMR SHEET) is provided separately. Please fill your **Test Code**, **Roll No.** and **Group** properly in the space given in the ANSWER SHEET.

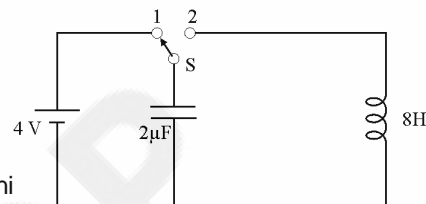
SECTION - I [Type-1]

SINGLE CORRECT ANSWER TYPE

This section contains 5 multiple choice questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

1. A $2\ \mu\text{F}$ capacitor is charged as shown in figure. Initially switch S is at position 1. The maximum current in inductor after it is turned to position 2 is :

- (A) 4 mA
(B) 1 mA
(C) 3 mA
(D) 2 mA



2. A police car with a siren of frequency 10 kHz is moving with uni wall moving towards the car with speed 18 km/hr which reflects the sound waves. The speed of sound in air is 320 m/s. The frequency of the siren heard by the police car driver after reflection from wall is nearly :

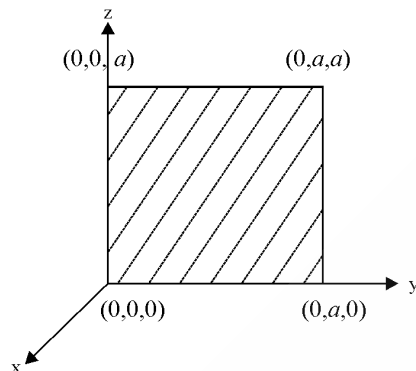
- (A) 11 kHz (B) 12 kHz (C) 10.5 kHz (D) 12.5 kHz

3. 22.4 litre of nitrogen gas at STP is adiabatically compressed to 0.7 litre. Taking the initial temperature to be T_1 , the work done on the gas in the process is :

- (A) $\frac{9}{8}RT_1$ (B) $\frac{3}{2}RT_1$ (C) $\frac{15}{2}RT_1$ (D) $\frac{9}{2}RT_1$

SPACE FOR ROUGH WORK

4. Consider an electric field $\vec{E} = E_0 y \hat{i}$, where E_0 is a constant y is y co-ordinate. The flux through the shaded area (as shown in the figure) due to this field is :



- (A) $\frac{E_0 a^3}{4}$ (B) $\frac{E_0 a^3}{3}$ (C) $E_0 a^3$ (D) $\frac{E_0 a^3}{2}$
5. The wavelength of the first spectral line in the Lyman series of hydrogen atom is 1616\AA . The wavelength of the third spectral line in the Lyman series of doubly-ionised lithium atom is nearly :
- (A) 144\AA (B) 152\AA (C) 166\AA (D) 122\AA

SPACE FOR ROUGH WORK

SECTION - I [Type-2]

MULTIPLE CORRECT ANSWERS TYPE

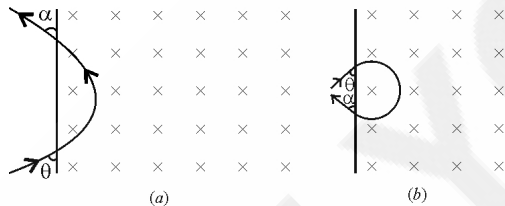
This section contains 4 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONE or MORE Choices are Correct:

6. A solid metal sphere A of radius R_A and a solid metal sphere B of radius $R_B (< R_A)$ are kept far apart and each is given charge 'Q'. Now they are connected by a thin metal wire. Then :

(A) Heat loss = $\frac{(R_B - R_A)^2 Q^2}{4\pi \epsilon_0 R_A R_B (R_A + R_B)}$ (B) $q_A (\text{final}) = \frac{2R_A Q}{R_A + R_B}$

(C) Heat loss = $\frac{(R_B - R_A)^2 Q^2}{8\pi \epsilon_0 R_A R_B (R_A + R_B)}$ (D) $q_B (\text{final}) = \frac{R_B Q}{R_A + R_B}$

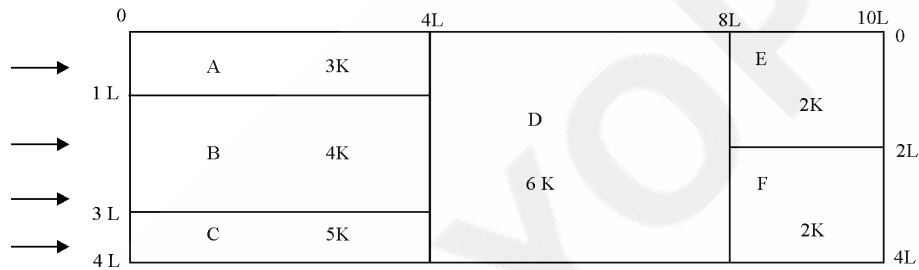
7. An electron and a proton are moving on straight parallel paths with same velocity. They enter a semi-infinite region of uniform magnetic field perpendicular to the velocity. Which of the following statements(s) is/are true ?



- (A) electron and proton cover paths shown in figures (b) and (a) respectively
 (B) They will come out travelling circular arc paths within the field
 (C) They will come out always at the same time
 (D) $\theta = \alpha$

SPACE FOR ROUGH WORK

8. During an experiment, an ideal gas is found to obey a condition $\frac{P^2}{\rho} = \text{constant}$ [ρ = density of the gas]. The gas is initially at temperature T , pressure P and density ρ . The gas expands such that density changes to $\frac{\rho}{2}$.
- (A) The pressure of the gas changes to $\sqrt{2}P$
 (B) The temperature of the gas changes to $\sqrt{2}T$
 (C) The graph of the above process on the $P - T$ diagram is parabola
 (D) The graph of the above process on the $P - T$ diagram is hyperbola
9. A composite block is made of slabs A, B, C, D, E and F of different thermal conductivities (given in terms of constant K) and sizes (given in terms of length, L) as shown in the figure. All slabs are of same width. Heat ' Q ' flows only from left to right through the blocks. Then in steady state :



- (A) heat flow through A and C slabs are same
 (B) heat flow through slab D is maximum
 (C) temperature difference across slab E is smallest
 (D) heat flow through $B = \text{heat flow through } A + \text{heat flow through } C$

SPACE FOR ROUGH WORK

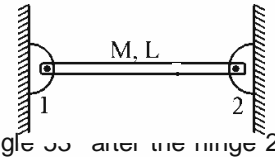
SECTION - I [TYPE-3]

COMPREHENSION TYPE

This section contains 2 paragraphs, each describing theory, experiments, data etc. 4 questions related to the two paragraphs with two questions on each paragraph. Each question has Only One option correct among the four given options (A), (B), (C) and (D).

Paragraph for questions 10 and 11

A uniform rod of mass $M = 2 \text{ kg}$ and length $L = 5 \text{ m}$ is suspended by two smooth hinges 1 and 2 as shown in figure. Due to weight of rod suddenly hinge 2 breaks. The rod starts to rotate downward about hinge 1. ($g = 10 \text{ m/s}^2$)

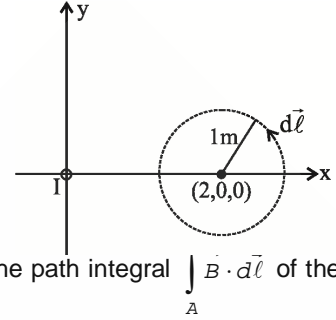


10. The force exerted by hinge 1 along the rod when it has rotated through angle 30° after the hinge 2 breaks is :
- (A) 46 N (B) 10 N (C) 25 N (D) 40 N
11. The acceleration of the end point of the rod of small mass dm when the rod becomes vertical is :
- (A) 30 m/s^2 (B) 20 m/s^2 (C) 10 m/s^2 (D) 0

SPACE FOR ROUGH WORK

Paragraph for questions 12 and 13

An infinitely long wire lying along z-axis carries a current I , flowing towards positive z-direction (out of plane). There is no other current. Consider a circle in x-y plane with centre at (2 meter, 0, 0) and radius 1 meter. Divide the circle in small segments and let $d\vec{\ell}$ denote the length of a small segment in anticlockwise direction, as shown.



12. Consider two points $A(3m, 0, 0)$ and $B(2m, 1, 0)$ on the given circle. The path integral $\int_A \vec{B} \cdot d\vec{\ell}$ of the

total magnetic field \vec{B} along the perimeter of the given circle from A to B is :

- (A) $\frac{\mu_0 I}{\pi} \tan^{-1} \frac{1}{2}$ (B) $\frac{\mu_0 I}{2\pi} \tan^{-1} \frac{1}{2}$ (C) $\frac{\mu_0 I}{2\pi} \sin^{-1} \frac{1}{2}$ (D) 0

13. The maximum value of path integral $\int \vec{B} \cdot d\vec{\ell}$ of the total magnetic field \vec{B} along the perimeter of the given circle between any two points on the circle is :

- (A) $\frac{\mu_0 I}{12}$ (B) $\frac{\mu_0 I}{8}$ (C) $\frac{\mu_0 I}{6}$ (D) 0

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SECTION - II
SINGLE INTEGER VALUE CORRECT TYPE

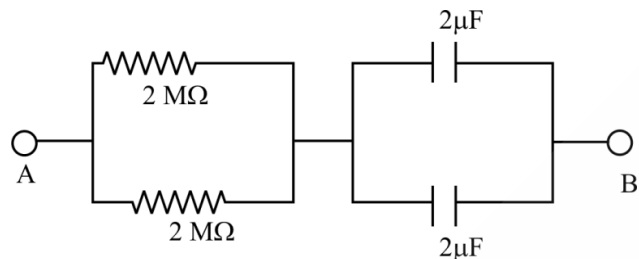
This section contains 5 single Integer Value Correct type Questions. Each question has an integer answer between 0 and 9. Fill the answer bubbles in the OMR Sheet APPROPRIATELY and CAREFULLY.

1. The activity of a freshly prepared radioactive sample reduces continuously by a factor of 3 in each t_0 successive time-intervals. Initial activity of the sample is A_0 . Initial number of nuclei is given by $\frac{A_0 t_0}{\ln P}$. Find value of P .
2. A closed loop of massless string of length l lies inside a planar soap film. When soap film within the loop is pricked by a pin the string forms a circular loop. The tension developed inside the string is $\frac{N \sigma l}{\pi}$. Find value of N .
3. Steel rod of length ' L ' at 40°C is fixed at both ends by rigid supports. The wire is cooled down from 40°C to 30°C . The coefficient of linear thermal expansion of the steel is $10^{-5}/^\circ\text{C}$. Young's modulus of steel is 10^{11} N/m^2 and radius of the cross section of rod is 1 mm. Assume that $L \gg$ diameter of the wire. Then the value of tension (in newtons) developed in steel rod is $2\pi \times N$. Find value of N .

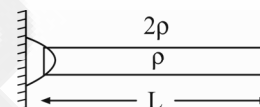
SPACE FOR ROUGH WORK

4. At time $t = 0$, a battery of 10 V is connected across points A and B in the given circuit. If the capacitors have no charge initially, at what time (in second) does the voltage across them become 4 V take

$$\ln\left(\frac{5}{3}\right) = \frac{1}{2}.$$



5. A rod of density ρ and length $L = \frac{10}{3}\text{ m}$ is suspended about one end and is surrounded by a liquid of density 2ρ as shown. The rod is released from rest in horizontal position. Find the angular speed (in rad/s) of rod, when it becomes vertical for first time.



[Take $g = 10\text{ m/s}^2$]

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SUBJECT - II (CHEMISTRY)

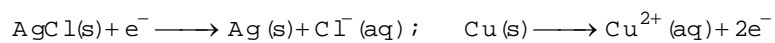
63 MARKS

SECTION - I [Type-1]

SINGLE CORRECT ANSWER TYPE

This section contains 5 multiple choice questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

1. An electrochemical cell consists of two half cell reactions.

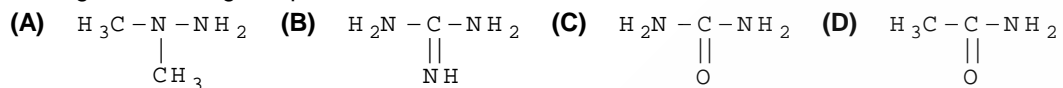


The mass of copper (in grams) used on passing 0.5A current for 1 hour is :

[Atomic mass of Cu = 63.6; F = 96500 C m o l⁻¹]

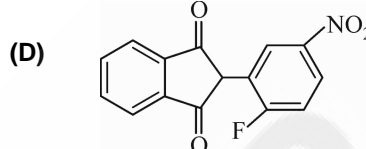
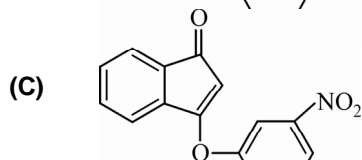
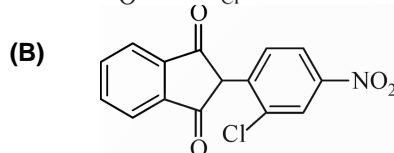
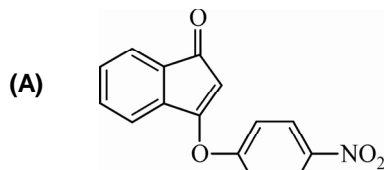
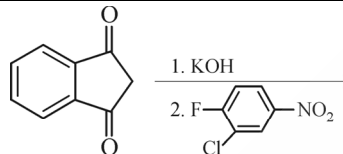
- (A) 0.88 (B) 1.18 (C) 0.29 (D) 0.59

2. Among the following compounds, the most basic is :



SPACE FOR ROUGH WORK

3. The major product of the following reaction is :



4. High purity is obtained by :

- (A) Electrolysis of acidified water using platinum electrodes.
 (B) Electrolysis of warm aqueous barium hydroxide using nickel electrodes.
 (C) Electrolysis of brine solution using platinum electrodes.
 (D) Reaction of steam with coke at high temperature in presence of catalyst.

5. Hydrolysis of 15.45 g of benzonitrile produced 10.98 g of benzoic acid. The percentage yield of acid formed is : [Atomic mass of H = 1, C = 12, O = 16]

- (A) 80% (B) 60% (C) 90% (D) 45%

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SECTION - I [Type-2]

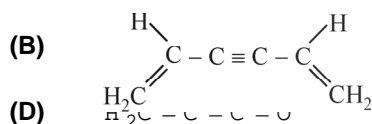
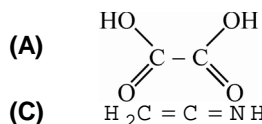
MULTIPLE CORRECT ANSWERS TYPE

This section contains 4 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONE or MORE Choices are Correct:

6. Extraction of metal from the ore Bauxite involves :
- (A) Carbon reduction of an oxide ore
 - (B) Electrolytic reduction using carbon electrodes
 - (C) Electrolytic refining
 - (D) Leaching by using NaOH
7. The correct statement(s) pertaining to the adsorption from solution phase is/are :
- (A) The extent of adsorption decreases with an increase in temperature
 - (B) The extent of adsorption increases with an increase of surface area of the adsorbent
 - (C) The extent of adsorption depends on the concentration of the solute in solution
 - (D) When a solution of acetic acid in water is shaken with charcoal, the concentration of the acid decreases in the solution

SPACE FOR ROUGH WORK

8. Amongst the given options, the compound(s) in which all atoms are in one plane in all the possible conformations (if any), is are :



9. According to kinetic theory of gases :

- (A) Pressure of gas is due to collision of gas molecules with wall of the vessel
 (B) The only forces that contribute to the pressure of gas are those that the molecules exert on each others
 (C) Gas pressure is independent of the nature of molecules
 (D) The forces between the molecules must be negligible

SPACE FOR ROUGH WORK

SECTION - I [TYPE-3]

COMPREHENSION TYPE

This section contains 2 paragraphs, each describing theory, experiments, data etc. 4 questions related to the two paragraphs with two questions on each paragraph. Each question has Only One option correct among the four given options (A), (B), (C) and (D).

Paragraph for questions 10 and 11

On heating compound (P) gives a gas (Q) which is a constituent of air. Another gas (R) which is obtained by reacting methane with steam in presence of NiO as catalyst, when reacts with gas (Q) in presence of catalyst gives a basic gas (S). Gas (S) on further oxidation in moist condition gives a compound which is a part of acid rain.

10. The compound (P) is :

- (A) $KClO_3$ (B) H_2O_2 (C) NH_4NO_2 (D) $CaSO_3$

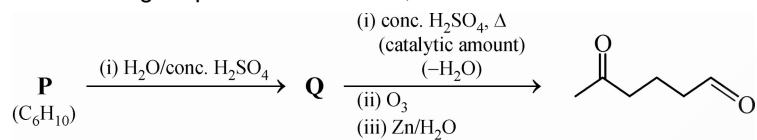
11. The compound (R) is :

- (A) CO (B) H_2 (C) CO_2 (D) CH_2O

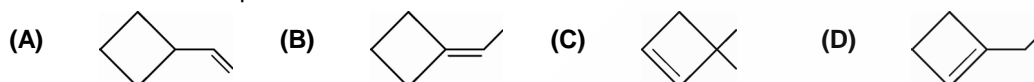
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Paragraph for questions 12 and 13

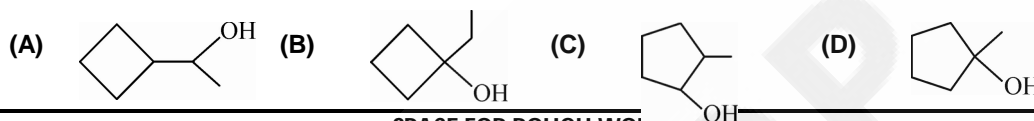
A cyclic hydrocarbon **P**, having molecular formula C_6H_{10} , gave 5-ketohexanal as the only organic product through the following sequence of reactions, in which **Q** is an intermediate organic compound.



12. The structure of compound **P** is :



13. The structure of the major compound **Q** is :

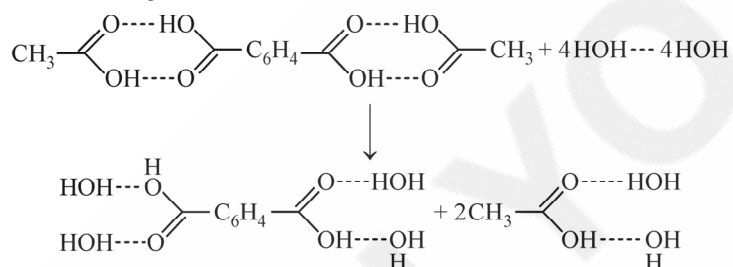


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SECTION - II
SINGLE INTEGER VALUE CORRECT TYPE

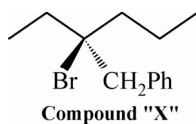
This section contains 5 single Integer Value Correct type Questions. Each question has an integer answer between 0 and 9. Fill the answer bubbles in the OMR Sheet APPROPRIATELY and CAREFULLY.

- The maximum number of electrons in most abundant noble gas molecule that can have spin quantum number, $m_s = -\frac{1}{2}$, is _____.
- Table tennis ball has a mass 10 g and a speed of 90 m/s. If speed is measured within an accuracy of x% then the uncertainty in position will be $1.46 \times 10^{-33} \text{ m}$. Find numerical value of x. $[h = 6.626 \times 10^{-34} \text{ Js}]$
- Given the average strength of a hydrogen bond is 5 kcal/mol, what is the overall free energy change (ΔG) of the following reaction?

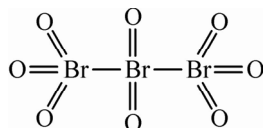


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4. The total number of alkenes possible by dehydrobromination of compound X using alcoholic KOH is _____.



5. The difference in the oxidation numbers of the two types of bromine atoms in Br_3O_8 is _____.



SPACE FOR ROUGH WORK

SECTION - I [Type-1]

SINGLE CORRECT ANSWER TYPE

This section contains 5 multiple choice questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

1. If the area bounded between the x -axis and the graph of $y = 6x - 3x^2$ between the ordinates $x = 1$ and $x = a$ is 19 units, then a can take :
- (A) 4 or -2
(B) two values in $(2, 3)$ and one in $(-1, 0)$
(C) two values, one in $(3, 4)$ and one in $(-2, -1)$
(D) none of these
2. Let α and β are the roots of $x^2 + 6x + 7 = 0$ and $S_n = \alpha^n + \beta^n$, then $\frac{S_6 + 7S_4}{2S_5} =$
- (A) 3 (B) 2 (C) -2 (D) -3

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3. The straight line $2x + 3y + 1 = 0$ bisects the angle between two straight lines of which one line is $3x + 2y + 4 = 0$. Then, the equation of the other line is :
- (A) $9x - 46y = -64$ (B) $9x + 46y = 28$ (C) $9x + 46y = 64$ (D) $3x + 26y = 20$
4. If α and β are roots of the equation $\log_5 \left(\frac{1}{5^x} + 125 \right) = \log_5 6 + 1 + \frac{1}{2x}$ then $\alpha + \beta =$
- (A) 1 (B) $3/4$ (C) $1/2$ (D) $1/4$
5. $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$, $\vec{c} = \hat{i} + \hat{j} - 2\hat{k}$. A vector coplanar with \vec{b} and \vec{c} whose projection on \vec{a} is magnitude $\sqrt{\frac{2}{3}}$ is :
- (A) $-2\hat{i} + 3\hat{j} - 3\hat{k}$ (B) $-2\hat{i} - \hat{j} + 5\hat{k}$ (C) $2\hat{i} + 3\hat{j} + 3\hat{k}$ (D) $2\hat{i} + \hat{j} + 5\hat{k}$

SPACE FOR ROUGH WORK

SECTION - I [Type-2]

MULTIPLE CORRECT ANSWERS TYPE

This section contains 4 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONE or MORE Choices are Correct:

6. Three vectors $\hat{i} + \hat{j}$, $\hat{j} + \hat{k}$ and $\hat{k} + \hat{i}$ taken two at a time form three planes. The three unit vectors drawn perpendicular to these three planes form a parallelepiped of volume :
- (A) $1/3$ (B) 4 (C) $(3\sqrt{3})/4$ (D) $4/3\sqrt{3}$
7. Let A and B be two nonsingular square matrices, A^T and B^T are the transpose matrices of A and B, respectively, then which of the following are correct ?
- (A) $B^T AB$ is symmetric matrix if A is symmetric
 (B) $B^T AB$ is symmetric matrix if B is symmetric
 (C) $B^T AB$ is skew-symmetric matrix for every matrix A
 (D) $B^T AB$ is skew-symmetric matrix if A is skew-symmetric
8. A function $f(x)$ satisfies the relation $f(x+y) = f(x) + f(y) + xy(x+y) \forall x, y \in R$. If $f'(0) = -1$, then :
- (A) $f(x)$ is a polynomial function (B) $f(x)$ is an exponential function
 (C) $f(x)$ is twice differentiable for all $x \in R$ (D) $f(3) = 6$
9. Suppose the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is confocal with the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$ and has eccentricity is 2. Then :
- (A) $a^2 + b^2 = 16$ (B) the hyperbola has no director circle
 (C) the length of the latus rectum is 12 (D) $a^2 - b^2 = 16$

SPACE FOR ROUGH WORK

SECTION - I [TYPE-3]

COMPREHENSION TYPE

This section contains 2 paragraphs, each describing theory, experiments, data etc. 4 questions related to the two paragraphs with two questions on each paragraph. Each question has Only One option correct among the four given options (A), (B), (C) and (D).

Paragraph for questions 10 and 11

Let $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$ satisfies $A^n = A^{n-2} + A^2 - I$ for $n \geq 3$. And trace of a square matrix X is equal to the sum

of elements in its principal diagonal. Further consider a matrix U with its column as U_1, U_2, U_3 such that

$$A^{50} U_1 = \begin{bmatrix} 1 \\ 25 \\ 25 \end{bmatrix}, A^{50} U_2 = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}, A^{50} U_3 = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

Then answer the following questions :

10. Trace of A^{50} equals :
 (A) 0 (B) 1 (C) 2 (D) 3
11. The value of $|U|$ equals :
 (A) 0 (B) 1 (C) 2 (D) -1

SPACE FOR ROUGH WORK

Paragraph for questions 12 and 13

A JEE aspirant estimates that she will be successful with an 80% chance if she studies 10 hours per day, with a 60% chance if she studies 7 hours per day, and with a 40% chance if she studies 4 hours per day. She further believes that she will study 10 hours, 7 hours, and 4 hours per day with probabilities 0.1, 0.2, and 0.7, respectively.

12. The chance she will be successful is :
(A) 0.28 (B) 0.38 (C) 0.48 (D) 0.58
13. Given that she is successful, the chance that she studies for 4 hours is :
(A) 6/12 (B) 7/12 (C) 8/12 (D) 9/12

SPACE FOR ROUGH WORK

SECTION - II
SINGLE INTEGER VALUE CORRECT TYPE

This section contains 5 single Integer Value Correct type Questions. Each question has an integer answer between 0 and 9. Fill the answer bubbles in the OMR Sheet APPROPRIATELY and CAREFULLY.

1. If $|z + 2 - i| = 5$ and maximum value of $|3z + 9 - 7i|$ is M , then the value of $M/4$ is _____.
2. The maximum integral value of a for which the equation $a \sin x + \cos 2x = 2a - 7$ has a solution is _____.
3. Let $a_1, a_2, a_3, \dots, a_{201}$ in G.P. with $a_{101} = 25$ and $\sum_{i=1}^{201} a_i = 625$. Then the value of $\sum_{i=1}^{201} \frac{1}{a_i}$ equals _____.
4. If a, b and c are positive and $9a + 3b + c = 90$, then the maximum value of $(\log a + \log b + \log c)$ is (base of the logarithm is 10).
5. If $f(x) = x + \int_0^1 t(x+t)f(t)dt$, then the value of $\frac{23}{3}f(0)$ is equal to _____.

SPACE FOR ROUGH WORK

☞ ☞ ☞ End of Mock JEE Advanced-11 | PAPER-1 ☞ ☞ ☞