



MATHEMATICS
Category-I (Q 1 to 30)

(Carry 1 mark each. Only one option is correct. Negative marks: - ¼)

1. If \vec{a} and \vec{b} be two unit vectors and θ is the angle between them, then $\sin \frac{\theta}{2}$ is

(A) $\frac{1}{2}|\vec{a}-\vec{b}|$

(B) 1

(C) $\frac{1}{2}|\vec{a}+\vec{b}|$

(D) 0



$\vec{a} \cdot \vec{b} = |\vec{a}| |\vec{b}| \cos \theta$
 $2 \vec{a} \cdot \vec{b} = 2 \sin \frac{\theta}{2}$
 $\vec{a} \cdot \vec{b} = 1 - \sin^2 \frac{\theta}{2}$
 $1 + \vec{a} \cdot \vec{b}$

2. The number of common tangents to the circles $x^2 + y^2 = 4$ and $x^2 + y^2 - 6x - 8y = 24$ is

(A) 0

(B) 1

(C) 3

(D) 4



3. A line is drawn through the point $P(3, 11)$ to cut the circle $x^2 + y^2 = 9$ at A and B . Then $PA \cdot PB$ is equal to

(A) 9

(B) 121

(C) 205

(D) 139

4. Let $\vec{a} = \lambda(\vec{i} + \vec{j} - \vec{k})$ and $\vec{b} = \mu(\vec{i} - \vec{j} + \vec{k})$ be two given vectors. \vec{c} is a unit vector perpendicular to \vec{a} but coplanar with \vec{a} and \vec{b} . Then the unit vector \vec{d} perpendicular to both \vec{a} and \vec{c} is

(A) $\frac{1}{\sqrt{6}}(2\vec{i} - \vec{j} + \vec{k})$

(B) $\frac{1}{\sqrt{2}}(\vec{j} + \vec{k})$

(C) $\frac{1}{\sqrt{6}}(\vec{i} - 2\vec{j} + \vec{k})$

(D) $\frac{1}{\sqrt{2}}(\vec{j} - \vec{k})$



$\frac{4x}{5x+2} + \frac{4}{1-x+2}$

$\frac{4x}{5x+2} + \frac{4}{4+2-x}$

$\frac{4x}{5x+2} + \frac{4}{5-x}$

$\frac{4x}{5x+2} + \frac{4}{2-x}$

5. If $f(x) = \frac{4^x}{4^x + 2}$, then $f(x) + f(1-x)$ is equal to

(A) 2^x

(B) 4

(C) 2

(D) 1



6. If $\omega (\neq 1)$ be a cube root of unity and $A = \begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix}$, then A^{2025} is equal to

(A) A

(B) $-A$

(C) I

(D) A^2



7. If $y = 2x + \cot^{-1} x + \log(\sqrt{1+x^2} - x)$, then y

- (A) decreases on $(-\infty, \infty)$
 (C) decreases on $[0, \infty)$

- (B) increases on $[0, \infty)$
 (D) increases on $(-\infty, \infty)$



8. If $u = \tan^{-1}\left(\frac{x^7 + y^7}{x}\right)$, then the value of the expression $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$ is equal to

- (A) $3 \sin 2u$
 (C) $5 \sin 2u$

- (B) $\sin 2u$
 (D) $7 \sin 2u$



$\frac{\partial \tan^{-1} \frac{x^7+y^7}{x}}{\partial x} + \frac{\partial \tan^{-1} \frac{x^7+y^7}{x}}{\partial y}$
 $\sec^2 2u$
 $2 \frac{6 \tan u}{6 \sin u}$
 $2 \cdot 3 \sin u$

9. If $f(x) = \lim_{n \rightarrow \infty} [2x + 4x^3 + \dots + 2nx^{2n-1}]$, $0 < x < 1$, then $\int f(x) dx$ is equal to

- (A) $-\sqrt{1-x^2}$
 (C) $\frac{1}{1-x^2}$

- (B) $\frac{1}{\sqrt{1-x^2}}$
 (D) 1



10. Let Z be a complex number such that $Z^4 - Z^3 + 2Z^2 - Z + 1 = 0$. The value of $|Z|$ is

- (A) $\frac{1}{4}$
 (C) $\frac{3}{4}$

- (B) $\frac{1}{2}$
 (D) 1



11. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix}$, then the value of the determinant $|A^{2009} - 5A^{2008}|$ is

- (A) -5
 (C) 4

- (B) -6
 (D) -9



12. Let $f(x) = a^x (a > 0)$ be written as $f(x) = g(x) + h(x)$, where $g(x)$ is even and $h(x)$ is odd. Then $g(x+y) + g(x-y)$ is equal to

- (A) $2g(x)g(y)$
 (C) $2g(x)$

- (B) $2g(x+y)g(x-y)$
 (D) $g(x)h(x)$



JELET-2025 (5)

13. A given right circular cone has a volume p , and the largest right circular cylinder that can be inscribed in the cone has a volume q . Then $p : q$ is

- (A) 9 : 4
(C) 7 : 2

- (B) 8 : 3
(D) 5 : 3



14. If $g'(x) = g(x)$, then $\int g(x)[f(x) + f'(x)]dx$ has the value (C_1 is a constant of integration)

- (A) $f'(x)g'(x) + C_1$
(C) $f(x)g(x) + C_1$

- (B) $f'(x)g(x) + C_1$
(D) $f(x)g'(x) + C_1$

15. If $f(x) = a|\sin 2x| + be^{3|x|} + c|2x|^3$, is differentiable at $x = 0$, then

- (A) $2a + 3b = 0$
(C) $a = b = c = 0$



- (B) $3b + 8c = 0$
(D) $a = 0$ and $c = 0$

$(g'(x) f(x) + f'(x) g(x))$

16. The value of $\lim_{x \rightarrow 0} \frac{\sin(\pi \cos^2 x)}{x^2}$ is

- (A) $-\pi$
(C) π

- (B) $\frac{\pi}{2}$
(D) 0

$\frac{\sin(\pi \cos^2 x)}{\sin(\pi \sin^2 x)} \cdot \left(\frac{\pi \sin^2 x}{x^2} \right)$

17. If $y = \tan^{-1} \frac{1}{1+x+x^2} + \tan^{-1} \frac{1}{x^2+3x+3} + \tan^{-1} \frac{1}{x^2+5x+7} + \dots$ + up to n terms, then $y'(0)$ is

- (A) $\frac{n^2}{n^2+1}$
(C) $\frac{-n^2}{1+n^2}$

- (B) $\frac{-1}{n^2+1}$
(D) 1



18. The value of $\int_{-1}^1 \frac{x(|x| + \cos x + \sin^2 x)}{(\sec^2 x + |x| + x^4)} dx$ is

- (A) 0
(C) 2

- (B) 1
(D) -1

19. A determinant is chosen at random from the set of all determinants of order 2 with elements 0 or 1 only. The event that the determinant is non-zero has the probability

- (A) $\frac{3}{16}$
(C) $\frac{1}{4}$



- (B) $\frac{3}{8}$
(D) $\frac{1}{2}$

$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$
 $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ $\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$



20. There are two balls in an urn whose colours are not known but each ball is either white or black. A white ball is put into the urn and then a ball is drawn from the urn. The probability that it is white is

- (A) $\frac{1}{4}$
- (C) $\frac{2}{3}$



- (B) $\frac{1}{3}$
- (D) $\frac{1}{6}$

Handwritten notes:
 $2C_1 + 1C_1$
 $\frac{3C_1 + 2C_1 + 1C_1}{3C_1}$

21. If the system of equations —

$$\begin{aligned} 2rx - 2y + 3z &= 0 \\ x + ry + 2z &= 0 \\ 2x + rz &= 0 \end{aligned}$$

has a non-trivial solution, then the real value of r is

- (A) 1
- (C) 3

- (B) -2
- (D) 2

Handwritten solution for Q21:

$$\begin{vmatrix} 2r & -2 & 3 \\ 1 & r & 2 \\ 2 & 0 & r \end{vmatrix} = 0$$

$$2r(r^2 - 2r - 4) + 2(2r - 8) + 3(0 - 2r) = 0$$

$$2r^3 - 4r^2 - 8r + 4r - 16 - 6r = 0$$

$$2r^3 - 4r^2 - 8r - 16 = 0$$

$$r^3 - 2r^2 - 4r - 8 = 0$$

$$(r - 4)(r^2 + 4r + 2) = 0$$

$$r = 4, -2 \pm \sqrt{2}$$

22. Two indistinguishable coins are tossed simultaneously. The probability of getting one head and one tail is

- (A) $\frac{1}{2}$
- (C) $\frac{1}{4}$



- (B) $\frac{1}{3}$
- (D) 1

Handwritten notes:
 $(H, H), (H, T), (T, H), (T, T)$
 $\frac{2}{4} = \frac{1}{2}$

23. The equations of tangents to the hyperbola $\frac{x^2}{4} - \frac{y^2}{3} = 1$ and which are perpendicular to $x + 2y = 0$ are

- (A) $y = 13 \pm 2x$
- (C) $y = 2x \pm \sqrt{19}$



- (B) $y = 2x \pm \sqrt{13}$
- (D) $y = 7 \pm 2x$

Handwritten solution for Q23:
 $2y = -\frac{x}{2}$
 $2m = -\frac{1}{2}$
 $m = -\frac{1}{4}$
 $2mx + c = -\frac{x}{2} + c$
 $2m^2 - 2m + c^2 = 1$
 $2(-\frac{1}{4})^2 - 2(-\frac{1}{4}) + c^2 = 1$
 $\frac{1}{8} + \frac{1}{2} + c^2 = 1$
 $c^2 = \frac{5}{8}$
 $c = \pm \sqrt{\frac{5}{8}}$
 $y = -\frac{x}{2} \pm \sqrt{\frac{5}{8}}$

24. The expression $\vec{i} \times (\vec{a} \times \vec{i}) + \vec{j} \times (\vec{a} \times \vec{j}) + \vec{k} \times (\vec{a} \times \vec{k})$ simplifies to

- (A) $\vec{0}$
- (C) $2\vec{a}$

- (B) \vec{a}
- (D) $4\vec{a}$



25. If A and B both are symmetric matrices, then $AB - BA$ is a

- (A) Skew symmetric matrix
- (C) Diagonal matrix

- (B) Symmetric matrix
- (D) Null matrix



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26. The length of the tangent drawn from any point on the circle $x^2 + y^2 + 2gx + 2fy + a = 0$ to the circle $x^2 + y^2 + 2gx + 2fy + \beta = 0$ is

(A) $\sqrt{\alpha - \beta}$

(B) $\sqrt{\frac{\alpha}{\beta}}$



(C) $\sqrt{\beta - \alpha}$

(D) $\sqrt{\alpha\beta}$

27. If for the differential equation $\frac{dy}{dx} = \frac{y}{x} + \phi\left(\frac{x}{y}\right)$, the general solution is $y = \frac{x}{\log(cx)}$ (c is a constant),

then $\phi\left(\frac{x}{y}\right)$ is given by

(A) $-\frac{y^2}{x^2}$



(B) $\frac{y^2}{x^2}$

(C) $-\frac{x^2}{y^2}$

(D) $\frac{x^2}{y^2}$

$y \log c + y \log u = u$
 $\log c \frac{dy}{dx} + \frac{y}{u} + \log u \frac{dy}{dx} = 1$

28. The general solution of $(x^4 e^x - 4xy^2)dx + 4x^2 y dy = 0$, is

(A) $e^x = 2\left(\frac{y}{x}\right)^2 + C$



(B) $e^x + 2\left(\frac{y}{x}\right)^2 = C$

(C) $e^x + 4\left(\frac{y}{x}\right)^2 = C$

(D) $e^x + 2\left(\frac{x}{y}\right)^2 = C$

(C is a constant of integration.)

$e^x \cdot 2 \left(\frac{2xy dy + 2y^2 dx}{x^2} \right)$
 $\frac{2xy^2}{x^2} + 4 \frac{xy dy}{x^2} = C$
 $\frac{2y^2}{x} - 4 \frac{y^2}{x} = C$

29. If the function $f(x) = \begin{cases} \frac{x^2 - (A+3)x + 3A}{x-3}, & \text{for } x \neq 3 \\ 5, & \text{for } x = 3 \end{cases}$ is continuous at $x = 3$, then the value of A is

equal to

(A) -5

(B) 5

(C) -3

(D) -2



$\frac{2x - (A+3)}{1} = 5$
 $6 - A - 3 = 5$
 $3 - A = 5$
 $3 - 5 = A$

30. The number of values of K for which the system of equations $(K+1)x + 8y = 4K$, $Kx + (K+3)y = 3K - 1$ has no solution is

(A) 0

(B) 1

(C) 2

(D) 3

$\begin{vmatrix} k+1 & 8 \\ k+3 & 3k-1 \end{vmatrix} = 0$
 $3k^2 - k + 3k - 1 - 8k - 24 = 0$
 $3k^2 - 6k - 25 = 0$

$3 \quad 5$
 $1 \quad 3$
 $4 \quad 2$
 $6 \quad 1$
 $2 \quad 8$
 0



MATHEMATICS
Category-II (Q 31 to 40)

(Carry 2 marks each. One or more options are correct. No negative marks)

31. Let E and F be two independent events. The probability that both E and F happen is $\frac{1}{12}$ and the probability that neither E nor F happens is $\frac{1}{2}$. Then

(A) $P(E) = \frac{1}{3}, P(F) = \frac{1}{4}$



(B) $P(E) = \frac{1}{2}, P(F) = \frac{1}{6}$

(C) $P(E) = \frac{1}{6}, P(F) = \frac{1}{2}$

(D) $P(E) = \frac{1}{4}, P(F) = \frac{1}{3}$

$P(E) \cdot P(F) = \frac{1}{12}$
 $P(E^c) \cdot P(F^c) = \frac{1}{2}$

~~$P(E) = \frac{1}{12}$~~ ~~$P(F) = \frac{1}{12}$~~
 ~~$P(E \cap F)$~~ $P(E \cap F) = \frac{1}{12}$
 $P(E^c \cap F^c) = \frac{1}{2}$

$P(E \cup F)^c = 1$
 $1 - P(E \cup F) = \frac{1}{2}$
 $\Rightarrow 1 - P(E) - P(F) + P(E \cap F) = \frac{1}{2}$
 $P(E \cup F) = \frac{1}{2}$

32. The system of equations —

$ax + by + cz = q - r$

$bx + cy + az = r - p$

$cx + ay + bz = p - q$ is



(A) consistent if $p = q = r$.

(B) inconsistent if $a = b = c$ and $p \neq q \neq r$.

(C) consistent if a, b, c are distinct and $a + b + c = 0$.

(D) inconsistent for any value of a, b, c .

$\tan^{-1} u = z$
 $u = \tan z$
 $du = \sec^2 z dz$

$\frac{14}{6}$

log

33. The value of $\int_{\frac{1}{a}}^a \frac{\tan^{-1} x}{x} dx$ is

(A) $\frac{\pi}{4} \log a$



(B) $\frac{\pi}{2} \log a$

(C) $\pi \log a$

(D) $\frac{1}{2} \log a$



34. If $I = \int \frac{(5x^8 + 7x^6)}{(x^2 + 1 + 2x^7)^2} dx$, then I is equal to

(A) $\frac{x^7}{2x^7 + x^2 + 1} + c_1$



(B) $\frac{x^5}{x^2 + 1 + 2x^7} + c_1$

(C) $\frac{1}{x^2 + 1 + 2x^7} + c_1$

(D) $\frac{p(x)}{q(x)} + c_1$ (where p and q are polynomial of same degree)

(c_1 is an integration constant.)

$$\frac{(x^2 + 1 + 2x^7)^6 - \sqrt{1 + 2x^7}}{(x^2 + 1 + 2x^7)^2}$$

35. Solution of the differential equation $\left(\frac{dy}{dx}\right)^2 - (e^x + e^{-x})\frac{dy}{dx} + 1 = 0$ are given by

(A) $y = -e^{-x} + c$



(B) $y - e^{-x} = c$

(C) $y + e^x = c$

(D) $y - e^x = c$ ($c =$ constant of integration.)

36. The straight line $y = mx + c$ intersects the circle $x^2 + y^2 = r^2$ at two distinct points if

(A) $-r\sqrt{1+m^2} < c \leq 0$

(B) $0 \leq c < r\sqrt{1+m^2}$

(C) $-c\sqrt{1-m^2} < r$



(D) $r < c\sqrt{1+m^2}$

37. Let $f(x) = \begin{cases} x^2 \sin \frac{1}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$. Then

(A) f and f' both are continuous at $x = 0$.



(B) f is continuous at $x = 0$.

(C) f is derivable at $x = 0$.

(D) f is derivable at $x = 0$ but f' is not continuous at $x = 0$.



38. Let $f(x) = \begin{cases} 3x^2 + 12x - 1, & -1 \leq x \leq 2 \\ 37 - x, & 2 < x \leq 3 \end{cases}$. Then

(A) $f(x)$ is increasing on $[-1, 2]$.

(C) $f'(2)$ does not exist.



(B) $f(x)$ is continuous on $[-1, 3]$.

(D) $f(x)$ has the maximum value at $x = 2$.

$12 + 24 - 1 = 35$

39. If A is a square matrix of order 3, then

(A) $|\text{adj } A| = |A|^2$ if $|A| \neq 0$.

(C) A is invertible if $|A| \neq 0$.

(B) $A(\text{adj } A) = |A|I_3$.

(D) $\text{adj } A$ is invertible if $|A| \neq 0$.



$6k + 12 = 12 + 12$

37

40. If $[x]$ is the greatest integer function, then $\lim_{x \rightarrow 0} x^8 \left[\frac{1}{x^3} \right]$ is

(A) a non-zero real number.

(C) a strictly positive integer.

(B) a rational number.

(D) zero.



$A^2 = \begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix}$
 $= \begin{bmatrix} 7 & 12 \\ 18 & 31 \end{bmatrix}$

$\begin{array}{l} | \quad k+1 \quad 4k \\ \quad \quad k \quad 3k-1 \end{array} |$
 $\sim 3k^2 - k + 3k - 1 - 4k^2$
 $\sim -k^2 + 2k - 1 \Rightarrow$
 $k^2 - 2k + 1 \Rightarrow$
 $(k-1)^2 \Rightarrow$
 $k=1$



JELET-2025 (11)

PHYSICS

Category-I (Q 41 to 65)

(Carry 1 mark each. Only one option is correct. Negative marks: - 1/4)

41. The variation of density of a cylindrical thick and long rod is $\rho = \rho_0 \frac{x^2}{L^2}$ where L is the length of rod and 'x' is the position of an elementary mass from one end of the rod. Then the position of its centre of mass from $x=0$ end is

(A) $\frac{2L}{3}$

(B) $\frac{L}{2}$

(C) $\frac{L}{3}$

(D) $\frac{3L}{4}$



42. If three vectors satisfy the relation $\vec{A} \cdot \vec{B} = 0$ and $\vec{A} \cdot \vec{C} = 0$, then \vec{A} can be parallel to

(A) \vec{C}

(B) \vec{B}

(C) $\vec{B} \times \vec{C}$

(D) $\vec{B} \cdot \vec{C}$



$\vec{A} \parallel (\vec{B} \times \vec{C})$
 $\vec{A} \cdot (\vec{B} \times \vec{C})$

43. A plano convex lens fits exactly into a plano concave lens. Their plane surfaces are parallel to each other. If lenses are made of different materials of refractive indices μ_1 & μ_2 and R is the radius of curvature of the curved surface of the lenses, the focal length of combination is

(A) $\frac{2R}{\mu_2 - \mu_1}$

(B) $\frac{R}{2(\mu_1 + \mu_2)}$

(C) $\frac{R}{2(\mu_1 - \mu_2)}$

(D) $\frac{R}{\mu_1 - \mu_2}$



44. The equation of state of some gases can be expressed as $\left(P + \frac{a}{V^2}\right)(V - b) = RT$ where P is pressure, V is volume, T is absolute temperature and a, b, R are constants. The dimension of 'a' is

(A) $[MT^5T^{-2}]$

(B) $[ML^{-1}T^{-2}]$

(C) $[L^3]$

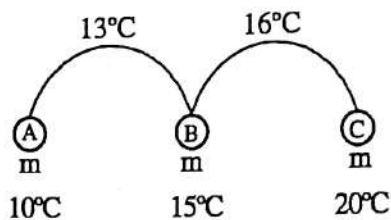
(D) $[L^6]$



$P = \frac{a}{V^2}$
 $\frac{ML^{-1}T^{-2}}{L^2} = \frac{a}{L^2}$



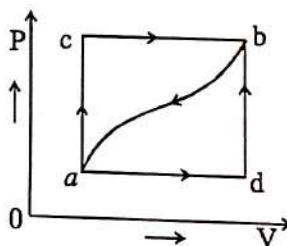
45. The temperature of equal masses of three different liquids A, B and C are 10°C , 15°C and 20°C respectively. The temperature when A and B are mixed is 13°C and when B and C are mixed, it is 16°C . What will be the temperature when A and C are mixed?



- (A) $\frac{140}{11}^{\circ}\text{C}$ (B) $\frac{110}{14}^{\circ}\text{C}$
 (C) 30°C (D) 15°C



46. When a system is taken from state 'a' to state 'b' along the path 'acb', it is found that a quantity of heat $Q = 200\text{ J}$ is absorbed by the system and a work $W = 80\text{ J}$ is done by it. Along the path 'adb', $Q = 144\text{ J}$. The work done along the path 'adb' is



- (A) 6 J (B) 12 J
 (C) 18 J (D) 24 J



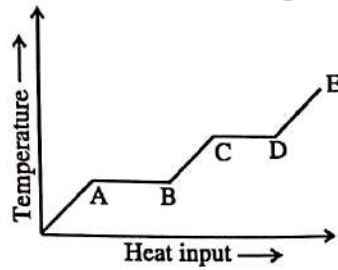
47. Two non-mixing liquids of densities ρ and $n\rho$ ($n > 1$) are put in a container. The height of each liquid is h . A solid cylinder of length L and density d is put in this container. The cylinder floats with its axis vertical and length pL ($p < 1$) in the denser liquid and the rest part within other liquid. The density ' d ' is equal to

- (A) $\{1 + (n + 1)p\}\rho$ (B) $\{2 + (n + 1)p\}\rho$
 (C) $\{2 + (n - 1)p\}\rho$ (D) $\{1 + (n - 1)p\}\rho$





48. A solid material is supplied with heat at a constant rate. The temperature of material is changing with heat input as shown in figure. What does the slope of DE represent?



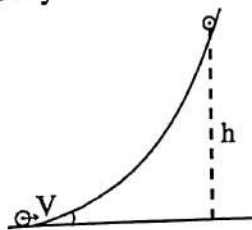
- (A) Latent heat of liquid
 (B) Latent heat of vapour
 (C) Heat capacity of vapour
 (D) Inverse of heat capacity of vapour

49. A stone of relative density ρ is released from rest on the surface of a lake. If the viscous effects are ignored, the stone sinks in water with an acceleration of

- (A) $g(1-\rho)$
 (B) $g(1+\rho)$
 (C) $g\left(1-\frac{1}{\rho}\right)$
 (D) $g\left(1+\frac{1}{\rho}\right)$



50. A disc of mass M and radius R rolls on a horizontal surface and then rolls up an inclined plane as shown in the figure. If the velocity of the disc is V , the height to which the disc will rise will be



- (A) $\frac{3V^2}{2g}$
 (B) $\frac{3V^2}{4g}$
 (C) $\frac{V^2}{4g}$
 (D) $\frac{V^2}{2g}$





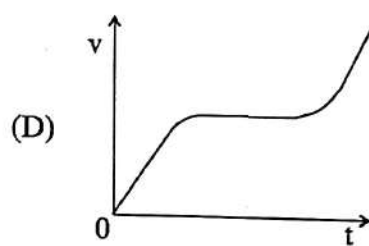
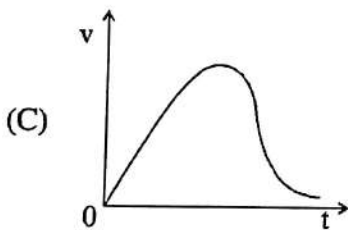
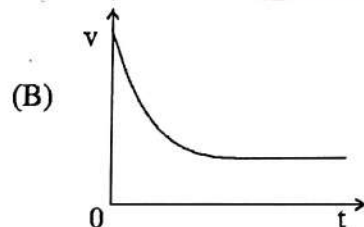
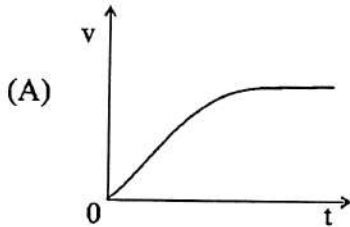
51. A stone is dropped from a certain height which can reach the ground in 5 sec. It is stopped after 3 sec. of its fall and is again released. The total time taken by the stone to reach the ground will be

- (A) 6.0 sec
- (C) 7.0 sec

- (B) 6.5 sec
- (D) 7.5 sec



52. Which of the graphs shown in figures represents the velocity – time ($v-t$) graph of a small spherical body falling in a viscous fluid? (Body just dropped on the surface of the viscous fluid)



53. The length and radii of two rods made of same material are in the ratio 1 : 2 and 2 : 3 respectively. The temperature difference between the ends for the two rods be the same in the steady state. The amount of heat flowing per second through them will be in the ratio of

- (A) 1 : 3
- (C) 8 : 9

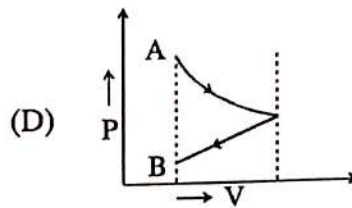
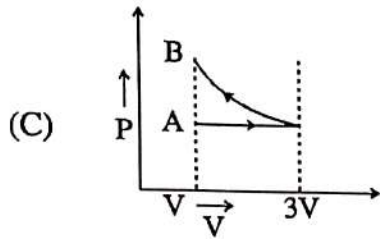
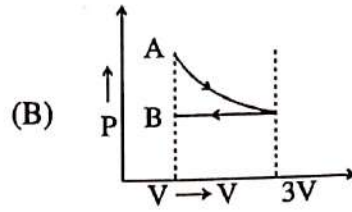
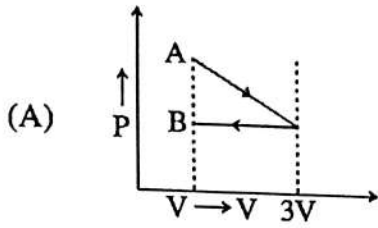


- (B) 4 : 3
- (D) 3 : 2



JEELET-2025 (15)

54. One mole of an ideal gas goes from an initial state A to final state B via two processes. It firstly undergoes isothermal expansion from volume V to $3V$ and then its volume is reduced from $3V$ to V at constant pressure. The correct $P - V$ diagram representing the two processes is



55. An artificial satellite moving in circular orbit around the earth has a total energy (kinetic + potential energy) E_0 . Its potential energy is

(A) $-E_0$

(B) $1.5E_0$

(C) $2E_0$

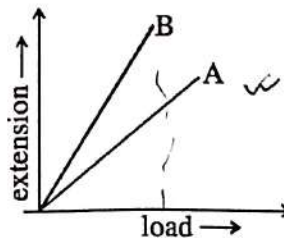
(D) E_0



E_0 $T.E = \frac{P.E}{2}$ $2 = k \cdot r^f$

$2E_0$

56. The dimensions of two wires A and B are the same, but their materials are different. Their extension-load graph are shown in figure. If Y_A and Y_B are the values of Young's modulus of elasticity of A and B respectively, then



$\frac{Y_B}{Y_A} = \frac{1}{2}$

(A) $Y_A > Y_B$

(B) $Y_A < Y_B$

(C) $Y_A = Y_B$

(D) $Y_B = 2Y_A$



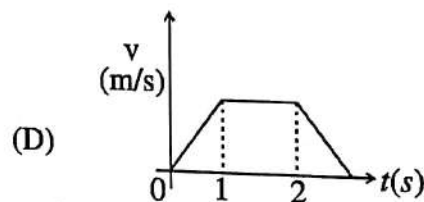
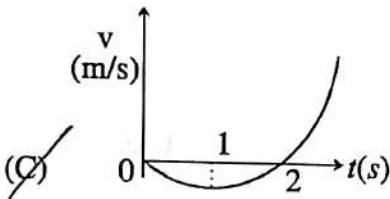
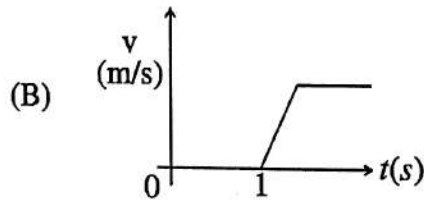
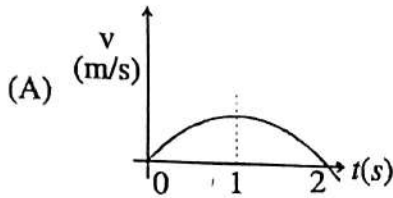
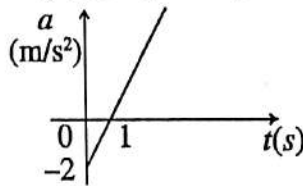
57. A spherical ball of radius $1 \times 10^{-4} \text{m}$ and density 10^4kg/m^3 falls freely under gravity through a distance h before entering a tank of water. If the velocity of the ball does not change after entering the water, find h . (Viscosity of water is $9.8 \times 10^{-6} \text{N} \cdot \text{s/m}^2$)

- (A) 20.41 m
(C) 0.2041 m

- (B) 2.041 m
(D) 204.1 m



58. The acceleration of a particle varies with time as shown in the figure. The corresponding velocity—time graph will be [Assume at $t = 0$, velocity $v = 0$]



59. A bomb initially at rest explodes by itself into three equal mass fragments. The velocities of two fragments are $(\hat{i} + 3\hat{j}) \text{ m/s}$ and $(2\hat{i} - 4\hat{j}) \text{ m/s}$. The velocity of the third fragment (in m/s) is

- (A) $(-3\hat{i} + \hat{j}) \text{ m/s}$
(C) $(\hat{i} - 3\hat{j}) \text{ m/s}$



- (B) $(3\hat{i} - \hat{j}) \text{ m/s}$
(D) $(\hat{i} + 3\hat{j}) \text{ m/s}$

60. A particle is shifted from a point $(0, 0, 1\text{m})$ to a point $(1\text{m}, 1\text{m}, 2\text{m})$ under the simultaneous action of forces. These forces are $\vec{F}_1 = (2\hat{i} + 3\hat{j} - \hat{k}) \text{ N}$ and $\vec{F}_2 = (\hat{i} - 2\hat{j} + 2\hat{k}) \text{ N}$. Find the work done by the resultant of these two forces.

- (A) 4 J
(C) 5 J

- (B) 1 J
(D) 3 J

$(3\hat{i} + \hat{j} - \hat{k}) \cdot (\hat{i} + \hat{j} + \hat{k})$
 $\rightarrow 3 + 1 - 1$



JELET-2025 (17)

61. The resistance $R = \frac{V}{I}$ where $V = 100 \pm 5$ volts and $I = 10 \pm 0.2$ amperes. The total percentage of error in R is

- (A) 5%
(C) 5.2%



- (B) 7%
(D) 9%

$\frac{100}{10}$ $5 + 0.2$
 5.2

62. A bullet hits horizontally and gets embedded in a solid block resting on a frictionless surface. In this process

- (A) momentum is conserved.
(B) kinetic energy is conserved.
(C) both momentum and kinetic energy are conserved.
(D) neither momentum nor kinetic energy is conserved.



63. A particle is executing SHM along a straight line. Its velocities at distances x_1 and x_2 from the mean position are v_1 and v_2 respectively. Its time period is

(A) $2\pi \sqrt{\frac{x_2^2 - x_1^2}{v_1^2 - v_2^2}}$

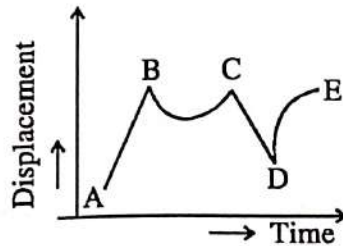
(B) $2\pi \sqrt{\frac{v_1^2 + v_2^2}{x_1^2 + x_2^2}}$

(C) $2\pi \sqrt{\frac{v_1^2 - v_2^2}{x_1^2 - x_2^2}}$

(D) $2\pi \sqrt{\frac{x_1^2 + x_2^2}{v_1^2 + v_2^2}}$



64. Figure shows the displacement of a particle moving along x axis as a function of time. The acceleration of the particle is zero in the region



- (A) AB and BC
(C) BC and CD

- (B) AB and CD
(D) CD and DE

65. Surfaces of two metal block A and B of same dimension made of same metal are illuminated with light of wavelength $\lambda_1 = 350 \text{ nm}$ and $\lambda_2 = 540 \text{ nm}$ respectively. If V_1 and V_2 represent the maximum speed of the photo-electrons emitted from block A and B respectively, then

(A) $V_1 = V_2$

(B) $V_1 > V_2$

(C) $V_1 < V_2$

(D) the relation between V_1 and V_2 can not be predicted from the supplied data.



5-

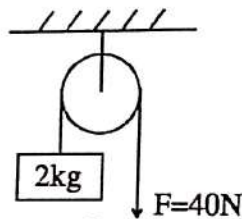
PHYSICS

Category-II (Q 66 to 70)

(Carry 2 marks each. One or more options are correct. No negative marks)



66. A block of mass 2kg is hanging over a smooth and light pulley through a light string. The other end of the string is pulled by a constant force $F = 40 \text{ N}$. At $t = 0$ the system is at rest as shown. Then in the time interval from $t = 0$ to $t = \frac{2}{\sqrt{10}}$ sec, pick up the correct statement(s). ($g = 10 \text{ m/s}^2$)



(A) Tension in the string is 20 N.

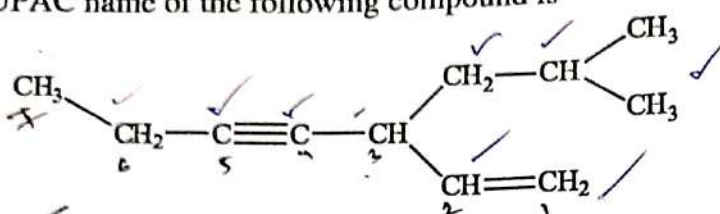
(B) Work done by gravity is -20 J .

(C) Workdone by tension on block is 80 J.

(D) Displacement of the block is 2 m.

(Carry 1 mark each. Only one option is correct. Negative marks: - 1/4)

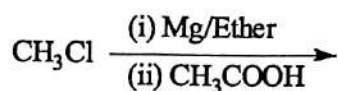
71. IUPAC name of the following compound is



- (A) 3-(2-Methylpropyl) hept-1-en-4-yne
(C) 7-Methyl-5-ethenyl-oct-3-yne

- (B) 2-Methyl-4-ethenyl-oct-5-yne
(D) None of the above

72. The major product in the following reaction is

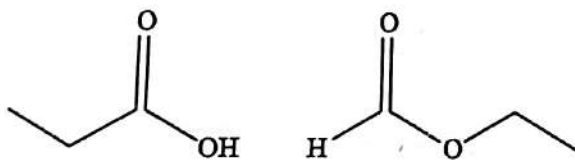


- (A) CH_4
(C) $\text{CH}_3\text{COOCH}_3$



- (B) C_2H_6
(D) None of these

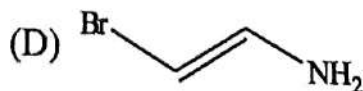
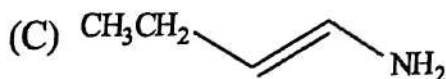
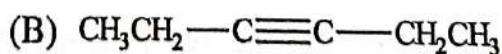
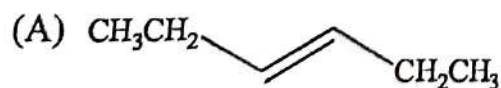
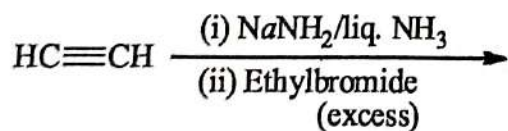
73. Which structural isomerism is exhibited by the following pairs?



- (A) Positional Isomerism
(C) Functional Isomerism

- (B) Chain Isomerism
(D) Geometrical Isomerism

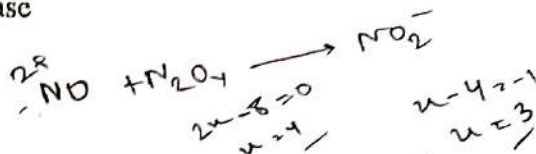
74. The major product in the following reaction is





JELET-2025 (21)

75. NO reacts with N_2O_4 in a basic solution to form NO_2^- . The reaction is classified as
- (A) Decomposition
 (B) Disproportionation
 (C) Comproportionation
 (D) Acid-Base



76. Suppose solution X has a pH of 6.0 and solution Y has a pH of 7.0. Which of the following statements about two solutions is correct?
- (A) Both X and Y are acidic.
 (B) Solution X is 10 times more acidic than solution Y.
 (C) $[OH^-] > [H^+]$ in solution Y.
 (D) None of the above



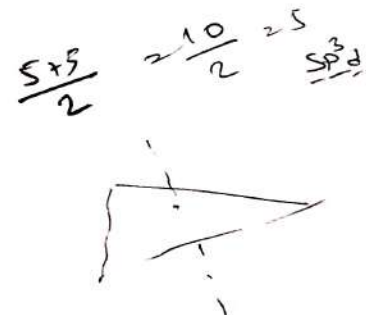
77. The standard EMF for the cell reaction $Zn + Cu^{2+} \rightleftharpoons Cu + Zn^{2+}$ is 1.10V at 25°C. The EMF for the cell reaction, when 0.1M Cu^{2+} and 0.1 M Zn^{2+} solutions are used, at 25°C is

- (A) 1.10 V
 (B) 0.110 V
 (C) -1.10 V
 (D) -0.110 V

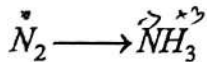


Handwritten calculation for Q77:
 $E = 1.10 - \log 2^2$
 $= 1.10$

78. How many types of P-Cl bonds are present in PCl_5 molecule?
- (A) One
 (B) Two
 (C) Three
 (D) Five



79. In the following conversion, how many electrons are involved?



- (A) 2
 (B) 3
 (C) 4
 (D) 6



80. An orbital having $n = 5$ and $l = 3$ is designated as

- (A) 5s
 (B) 5p
 (C) 5d
 (D) 5f

Handwritten notes for Q80:
 5f 0, 1, 2, 3



81. Which of the following salts will give highest pH in water?

(A) KCl

(B) NaCl

(C) Na₂CO₃

(D) CuSO₄



82. In which of the following equilibria would a decrease in volume promote the formation of more products?

(A) N₂(g) + O₂(g) ⇌ 2NO(g)

(B) N₂O₄(g) ⇌ 2NO₂(g)

(C) H₂O(l) + CO₂(g) ⇌ H₂CO₃(aq.)

(D) CaCO₃(s) ⇌ CaO(s) + CO₂(g)



83. Which of the following metals can be obtained by the electrolysis of an aqueous solution of their salts?

(A) Na

(B) Mg

(C) Ca

(D) Al



84. Silicon doped with electron-rich impurity forms

(A) Insulator

(B) *p*-type semiconductor

(C) *n*-type semiconductor

(D) amorphous powder



C₂

85. The hybridization state of a carbanion is

(A) *sp*

(B) *sp*²

(C) *sp*³

(D) *sp*⁴





JELET-2025 (23)

CHEMISTRY

Category-II (Q 86 to 90)

(Carry 2 marks each. One or more options are correct. No negative marks)

86. By adding water to the solution of ionic compound, its

- (I) concentration remains same.
- (II) concentration increases.
- (III) ionization may increase.
- (IV) concentration decreases.



- (A) I
- (C) III

- (B) II
- (D) IV

87. Which of the following statement about HNO_3 is/are correct?

- (A) It is a solid.
- (C) It is a reducing agent.



- (B) It is an oxoacid of nitrogen.
- (D) It is an oxidizing agent.

88. In Rutherford's gold leaf experiment, the scattering of α -particles takes place. In this process

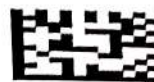
- (I) coulombic force is involved
- (II) nuclear force is involved
- (III) path of α -particle is parabolic
- (IV) path of α -particle is hyperbolic



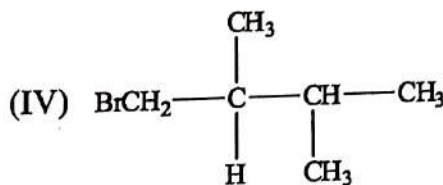
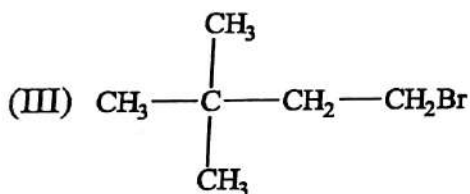
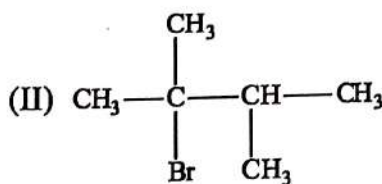
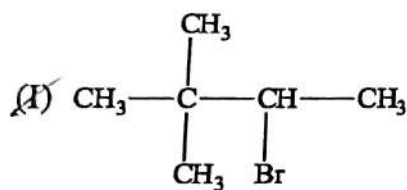
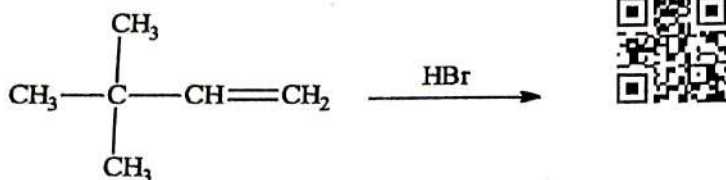
- (A) I
- (C) III

- (B) II
- (D) IV





89. The product(s) in the following reaction is/are



- (A) I
(C) I and II

- (B) II
(D) III and IV

$k_p < k_c$

90. For which of the following reactions, k_p is less than k_c ?

- (I) $\text{N}_2\text{O}_4 \rightleftharpoons 2\text{NO}_2$
 (II) $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3$
 (III) $\text{H}_2 + \text{I}_2 \rightleftharpoons 2\text{HI}$
 (IV) $\text{CO} + \text{H}_2\text{O} \rightleftharpoons \text{CO}_2 + \text{H}_2$



- (A) I
(C) III

- (B) II
(D) IV

$k_p = k_c (RT)^{-1}$
 $k_p = k_c (RT)^{-2}$
 $k_p = k_c (RT)^0$
 $k_p = k_c (RT)^0$



Fundamentals of Electrical & Electronics Engineering
Category-I (Q 91 to 100)

(Carry 1 mark each. Only one option is correct. Negative marks: - 1/4)

91. An ideal single phase transformer with 200V, 50Hz supply at its primary side is delivering to 100 watt resistive load at 10V connected to its secondary side. The current drawn by the transformer from the supply is

- (A) 0A
- (C) 1.0A



- (B) 0.5A
- (D) 10A

92. A power supply has a full load voltage of 10V. Its no load voltage for 0% regulation is

- (A) 10V
- (C) less than 10V

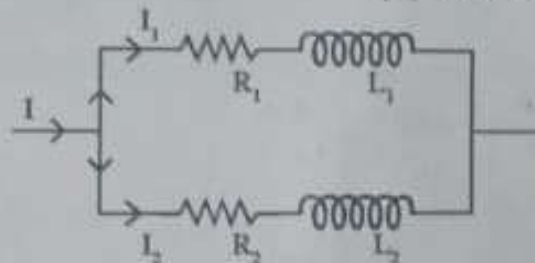
- (B) 0V
- (D) greater than 10V



93. The following circuit carries alternating currents I , I_1 and I_2 . Under which condition I_1 , I_2 and I will be in the same phase? (The frequency of the alternating current is 50Hz)

- (A) $R_1 R_2 = L_1 L_2$
- (C) $R_1 L_1 = R_2 L_2$

- (B) $\frac{R_1}{R_2} = \frac{L_1}{L_2}$
- (D) None of these



94. In a PNP transistor, the emitter current (I_E) is 10mA and the base current (I_B) is 0.1mA. Its collector current (I_C) would be

- (A) 9.9 mA
- (C) 100 mA



- (B) 10.1 mA
- (D) 0.9 mA



$10 = I_C = 0.1$

$I_E = I_C + I_B$

$I_E = I_C + I_B$

$= 10 - 0.1$

95. Simplify the Boolean Expression: $(A+B).(A+B')+A'$

- (A) A+B
- (C) B



- (B) 1
- (D) A'

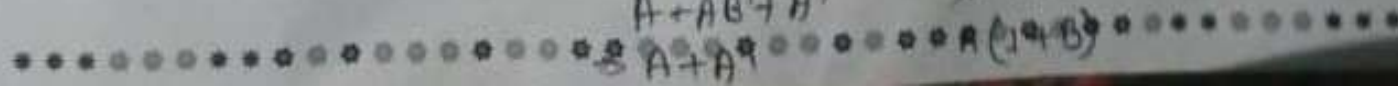
$(A+B)(A+B')A'$

$AA + AB' + BA + BB' + A'$

$A + AB' + BA + A'$

$A + AB' + A'$

$A + A'$





96. Which statement is valid for CMOS technology?

- (A) Employs only N-type MOSFETs
- (B) Employs only P-type MOSFETs
- (C) Consumes high static power
- (D) Employs both N-type and P-type MOSFETs



97. Which of the OPAMP based configurations provides no phase difference between input and output?

- (A) Inverting amplifier
- (B) Non-inverting amplifier
- (C) Integrator
- (D) Differentiator

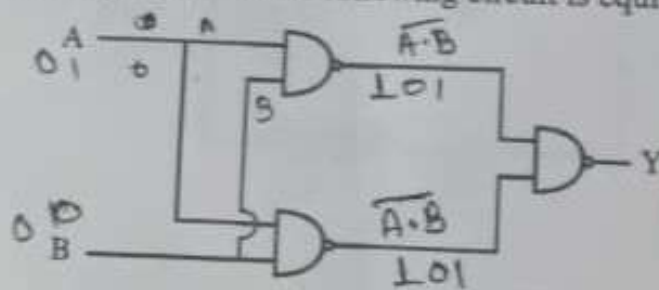


98. Which of the following electrical machines has the highest efficiency?

- (A) DC shunt motor
- (B) DC series motor
- (C) Single phase induction motor
- (D) Transformer



99. The combination of Logic Gates in the following circuit is equivalent to



- (A) XOR Gate
- (C) XNOR Gate



- (B) AND Gate
- (D) NAND Gate

Handwritten work for Q99:
 $\overline{A \cdot B} \cdot \overline{A \cdot B}$
 $\overline{A \cdot B} + \overline{A \cdot B}$
 $AB + A \cdot B$
 AB
 Truth table:
 0 0 0
 0 1 0
 1 1 1

100. A PMMC ammeter measures current $i(t) = (5 + 5 \sin 100\pi t) A$. The reading of the meter will be

- (A) 5 A
- (B) $(5 + \frac{5}{\sqrt{2}}) A$
- (C) 0 A
- (D) None of these



Handwritten: V_m
 I_m