10 PRACTICE PAPER

Time allowed: 45 minutes **Maximum Marks: 200**

General Instructions: *As given in Practice Paper – 1.*

Section–A

Choose the correct option:

1. **The matrix** $A = \begin{bmatrix} 0 & 0 & 5 \\ 0 & 5 & 0 \\ 5 & 0 & 0 \end{bmatrix}$ **is a**

(*a*) Scalar matrix (*b*) Diagonal matrix (*c*) Unit matrix (*d*) Square matrix

2. **If** $\begin{vmatrix} 4-x & 4+x & 4+x \\ 4+x & 4-x & 4+x \\ 4+x & 4+x & 4-x \end{vmatrix} = 0,$ **then value of** x **is**

(*a*) –12, 8 (*b*) –12, 0 (*c*) 12, –8 (*d*) None of these

3. **If** $A = [a_{ij}]$ **is a matrix of order 2 × 2, such that** $|A| = -15$ **and** C_{ij} **represents the cofactor of** a_{ij}, **then value of** $a_{21}C_{21} + a_{22}C_{22} + a_{23}C_{23}$ **is**

(*a*) –15 (*b*) 15 (*c*) 31 (*d*) 0

4. **If** $f(x) = e^{\alpha x}$ **then** $f''(0)$ **is equal to**

(*a*) 0 (*b*) α (*c*) α^2 (*d*) None of these

5. **If** m **be the slope of a tangent to the curve** $e^y = 1 + x^2$ **then**

(*a*) $|m| > 1$ (*b*) $m < 1$ (*c*) $|m| < 1$ (*d*) $|m| \leq 1$

6. $\int \frac{dx}{(x^2+a^2)(x^2+b^2)}$ **equals**

(*a*) $\frac{1}{b^2-a^2}\left[\frac{1}{b}\tan^{-1}\left(\frac{x}{a}\right) - \frac{1}{a}\tan^{-1}(x)\right] + C$

(*b*) $\frac{1}{b^2-a^2}\left[\frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right) - \frac{1}{b}\tan^{-1}\left(\frac{x}{b}\right)\right] + C$

(*c*) $\frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right) + \frac{1}{b}\tan^{-1}\left(\frac{x}{b}\right) + C$

(*d*) $\frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right) - \frac{1}{b}\tan^{-1}\left(\frac{x}{b}\right) + C$

7. $\int xe^{2x}(1+x)\,dx$, **equals**

(a) $\frac{xe^x}{2}+C$ (b) $\frac{(e^x)^2}{2}+C$ (c) $\frac{(1+x)^2}{2}+C$ (d) $\frac{(xe^x)^2}{2}+C$

8. $\int (x^x)^2(1+\log x)\,dx$, **equals**

(a) $\frac{(x^x)^2}{2}+C$ (b) x^x+C (c) $\frac{x^x}{2}+C$ (d) none of these

9. The value of $\int_0^a \log(\cot a+\tan x)\,dx$, **where** $a \in (0, \pi/2)$ **is**

(a) $a\log(\sin a)$ (b) $-a\cos a$ (c) $-a\log(\sin a)$ (d) $\log(\sin a)$

10. The area bounded by the curve $y = \sin x$ **between** $x = 0$ **and** $x = 2\pi$ **is**

(a) 14 sq. units (b) 4 sq. units (c) 3 sq. units (d) 1 sq. unit

11. The degree of the differential equation $\frac{d^2y}{dx^2}+\left(\frac{dy}{dx}\right)^3+6y^5=0$ **is**

(a) 1 (b) 2 (c) 3 (d) 5

12. The solution of differential equation $\cos x\sin y\,dx+\sin x\cos y\,dy=0$ **is**

(a) $\frac{\sin x}{\sin y}=C$ (b) $\sin x+\sin y=C$

(c) $\sin x \,.\, \sin y=C$ (d) $\cos x \,.\, \cos y=C$

13. The point at which the maximum value of $Z = x + y$, **subject to constraints** $x+2y\le 70,\ 2x+y\le 95,\ x,y\ge 0$ **is obtained, is**

(a) (30, 25) (b) (20, 35) (c) (35, 20) (d) (40, 15)

14. The probability that in 10 throws of a fair die, a score which is a multiple of 3 will be obtained in at least 8 of the throws, is

(a) $\frac{7}{10^{10}}$ (b) $\frac{201}{3^{10}}$ (c) $\frac{1}{9}$ (d) $\frac{201}{10}$

15. A discrete random variable X has the following probability distribution then the value of C **is**

X	1	2	3	4	5	6	7
$P(X)$	C	$2C$	$2C$	$3C$	C^2	$2C^2$	$7C^2+C$

(a) $\frac{1}{10}$ (b) $\frac{3}{10}$ (c) $\frac{1}{5}$ (d) $\frac{2}{5}$

Section–B (B1)

16. ***Read the following statements.***

Statement I : Let A and B are finite sets containing m and n respectively. Then the number of relation defined from A to B is 2^{mn}.

Statement II : Let $A = \{1, 2\}$ and a relation $R = \{(1, 1)\}$ defined on A is reflexive relation.

Choose the correct option:

(a) Statement I is correct but statement II is not correct.

(b) Statement II is correct but statement I is not correct.

(c) Both statements I and II are correct.

(d) None of these

17. For real numbers x **and** y**, define** xRy **if and only if** $x-y+\sqrt{2}$ **is an irrational number. Then the relation** R **is**

(a) reflexive (b) symmetric (c) transitive (d) none of these

18. The value of 'a' for which $f:\mathbb{R}\longrightarrow\mathbb{R}$ **defined by** $f(x)=\frac{ax+7}{x^2+4}$ **is invertible, is**

(a) (0, 2) (b) $(1, \infty)$ (c) $(0, \infty)$ (d) None of these

19. **Let * be a binary operation on $\mathbb{R}$ as $a * b = b^a$ then 2 * 3 is equal to**

(*a*) 9 (*b*) 8 (*c*) 27 (*d*) None of these

20. **The domain of the function $f(x) = \log_{3+x}(x^2 - 1)$ is**

(*a*) $(-3, -1) \cup (1, \infty)$ (*b*) $[-3, -1) \cup [1, \infty)$

(*c*) $(-3, -2) \cup (-2, -1) \cup (1, \infty)$ (*d*) $[-3, -2) \cup (-2, -1) \cup [1, \infty)$

21. **The domain of $\sin^{-1}[x]$ is given by**

(*a*) $[-1, 1]$ (*b*) $[-1, 2)$ (*c*) $\{-1, 0, 1\}$ (*d*) None of these

22. **The value of $\sin^{-1}(x^2 - 6x + 11) + \cos^{-1}(x^2 - 6x + 11)$ for all $x \in R$ is**

(*a*) 0 (*b*) 1 (*c*) $\frac{\pi}{2}$ (*d*) none of these

23. **The domain of $y = \cos^{-1}(x^2 - 4)$ is**

(*a*) $[-1, 1]$ (*b*) $[-\sqrt{5}, -\sqrt{3}] \cap [\sqrt{3}, \sqrt{5}]$ (*c*) $[-\sqrt{5}, -\sqrt{3}] \cup [\sqrt{3}, \sqrt{5}]$ (*d*) $[0, \pi]$

24. **The domain of the function defined $f(x) = \sin^{-1} x + \cos x$ is**

(*a*) ϕ (*b*) $(-\infty, \infty)$ (*c*) $[-1, 1]$ (*d*) $[0, \pi]$

25. ***Read the following statements.***

Statement I : If A is a square matrix then $(A - A')$ is a skew symmetric matrix.

Statement II : If A is a square matrix then $(A - A')$ is a symmetric matrix.

Choose the correct option:

(*a*) Statement I is correct but statement II is not correct.

(*b*) Statement II is correct but statement I is not correct.

(*c*) Both statements I and II are correct.

(*d*) Both statements I and II are not correct.

26. **If $A = [a \ \ b]$, $B = [-b \ \ -a]$ and $C = \begin{bmatrix} a \\ -a \end{bmatrix}$, then which is the correct statement?**

(*a*) $A = -B$ (*b*) $A + B = B + A$ (*c*) $AC = BC$ (*d*) $CA = CB$

27. **The maximum value of $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+\sin\theta & 1 \\ 1 & 1 & 1+\cos\theta \end{vmatrix}$ is**

(*a*) $\frac{1}{2}$ (*b*) $\frac{-1}{2}$ (*c*) 0 (*d*) 4

28. **If $A = \begin{bmatrix} 3 & 1 \\ 2 & 5 \end{bmatrix}$ then value of A^{-1} is**

(*a*) $\frac{1}{13}\begin{bmatrix} 5 & -1 \\ -2 & 3 \end{bmatrix}$ (*b*) $\begin{bmatrix} 5 & -1 \\ -2 & 3 \end{bmatrix}$ (*c*) $\frac{1}{2}\begin{bmatrix} 5 & -1 \\ -2 & 3 \end{bmatrix}$ (*d*) $\frac{1}{13}\begin{bmatrix} 5 & 2 \\ -1 & 3 \end{bmatrix}$

29. **Differentiation of $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ w.r.t. $\tan^{-1}x$, $-1 < x < 1$ is**

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

30. **The derivatives of $\sin x$ w.r.t. $\cos x$ is**

(*a*) $\cot x$ (*b*) $-\cot x$ (*c*) $\sin x$ (*d*) $-\cos x$

31. **The value of c in Mean Value Theorem for the function $f(x) = x^2 - 4x - 3, \forall\, x \in [1, 3]$ is**

(*a*) 3 (*b*) 1 (*c*) 2 (*d*) none of these

32. **If $f(x) = x - 3$ and $g(x) = \dfrac{x^2}{3} + 1$, then which of the following can be a discontinuous function?**

(*a*) $f(x) + g(x)$ (*b*) $f(x) \,.\, g(x)$ (*c*) $f(x) - g(x)$ (*d*) $\dfrac{g(x)}{f(x)}$

33. **The number of values of x where the function $f(x) = \cos x + \cos(\sqrt{2}\,x)$ attains its maximum is**

(*a*) 0 (*b*) 1 (*c*) 2 (*d*) infinite

34. $\displaystyle\int \frac{(x^2 - 1)}{(x^2 + 1)\sqrt{x^4 + 1}}\, dx$, **equals**

(*a*) $\sec^{-1}\left(\dfrac{x^2+1}{x\sqrt{2}}\right) + C$ (*b*) $\dfrac{1}{\sqrt{2}}\sec^{-1}\left(\dfrac{x^2+1}{\sqrt{2}}\right) + C$ (*c*) $\dfrac{1}{\sqrt{2}}\sec^{-1}\left(\dfrac{x^2+1}{x\sqrt{2}}\right) + C$ (*d*) none of these

35. **If $\displaystyle\int_0^1 \frac{e^t\, dt}{1 + t} = a$, then $\displaystyle\int_0^1 \frac{e^t\, dt}{(1 + t)^2}$ is equal to**

(*a*) $a - 1 + \dfrac{e}{2}$ (*b*) $a + 1 - \dfrac{e}{2}$ (*c*) $a - 1 - \dfrac{e}{2}$ (*d*) $a + 1 + \dfrac{e}{2}$

36. **Let $p(x)$ be a function defined on R such that $p'(x) = p'(1 - x)$, for all $x \in [0, 1]$, $p(0) = 1$ and $p(1) = 41$. Then $\displaystyle\int_0^1 p(x)\, dx$ is equal to**

(*a*) 41 (*b*) 51 (*c*) 21 (*d*) 42

37. **The area bounded by the lines $x + 2y = 2$, $y - x = 1$ and $2x + y = 7$ is**

(*a*) 4 sq. units (*b*) 3 sq. units (*c*) 6 sq. units (*d*) none of these

38. **The differential equation of family of curves $y^2 = 4a\,(x+a)$ is**

(*a*) $y^2 = 4\dfrac{dy}{dx}\left(x + \dfrac{dy}{dx}\right)$ (*b*) $2y\dfrac{dy}{dx} = 4a$

(*c*) $y\dfrac{d^2y}{dx^2} + \left(\dfrac{dy}{dx}\right)^2 = 0$ (*d*) $2x\dfrac{dy}{dx} + y\left(\dfrac{dy}{dx}\right)^2 - y = 0$

39. ***Read the following statements.***

Statement I : Integrating factor for the linear differential equation $\dfrac{dy}{dx} + y\tan x = \sec x$ is $\sec x$.

Statement II : The differential equation $\dfrac{dy}{dx} + x = 0$ is a differential equation of degree 1.

Choose the correct option:

(*a*) Statement I is correct but statement II is not correct.

(*b*) Statement II is correct but statement I is not correct.

(*c*) Both statements I and II are correct.

(*d*) None of these

40. **The value of k for which the points $A \equiv (1, 0, 2)$, $B \equiv (3, 1, 0)$, $C \equiv (2, 0, 2)$, $D \equiv (k, 1, 0)$ are coplanar, is**

(*a*) 0 (*b*) 1 (*c*) 2 (*d*) For all values of k

41. **If $\vec{A}, \vec{B}, \vec{C}$ are three non-coplanar vectors then $\dfrac{\vec{A}\cdot(\vec{B}\times\vec{C})}{(\vec{C}\times\vec{A})\cdot\vec{B}}+\dfrac{\vec{B}\cdot(\vec{A}\times\vec{C})}{\vec{C}\cdot(\vec{A}\times\vec{B})}$ is equal to**

(*a*) 2 (*b*) 3 (*c*) 0 (*d*) None of these

42. **The value of $3\left[|\vec{a}\times\hat{i}|^2+|\vec{a}\times\hat{j}|^2+|\vec{a}\times\hat{k}|^2\right]$ is**

(*a*) $4\vec{a}^2$ (*b*) $\vec{a}^2$ (*c*) $3\vec{a}^2$ (*d*) $6\vec{a}^2$

43. **$\hat{a}$ and $\hat{b}$ are two unit vectors and α is an angle between them, then**

(*a*) $\frac{1}{2}|\hat{a}-\hat{b}| = \sin\frac{\alpha}{2}$ (*b*) $\frac{1}{2}(\hat{a}-\hat{b})^2 = 1-\sin\alpha$ (*c*) $\hat{a}\times\hat{b} = \sin\alpha$ (*d*) $\frac{1}{2}(\hat{a}-\hat{b})^2 = 1+\cos\alpha$

44. **A line makes equal angle with co-ordinate axes. Direction cosines of this line are**

(*a*) $\pm(1, 1, 1)$ (*b*) $\pm\left(\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$ (*c*) $\pm\left(\frac{1}{3}, \frac{1}{3}, \frac{1}{3}\right)$ (*d*) $\pm\left(\frac{1}{\sqrt{3}}, \frac{-1}{\sqrt{3}}, \frac{-1}{\sqrt{3}}\right)$

45. **The image of the point having position vector $\hat{i}+3\hat{j}+4\hat{k}$ in the plane $\vec{r}.(2\hat{i}-\hat{j}+\hat{k})+3=0$ is**

(*a*) $-3\hat{i}+5\hat{j}+2\hat{k}$ (*b*) $5\hat{i}-3\hat{j}-7\hat{k}$ (*c*) $-3\hat{i}+5\hat{j}-2\hat{k}$ (*d*) None of these

46. **The co-ordinates of the foot of perpendicular drawn from point $A(1, 8, 4)$ to the line joining the points $B(0, -1, 3)$ and $C(2, -3, -1)$ are**

(*a*) $\left(\frac{-7}{3}, \frac{2}{3}, \frac{11}{3}\right)$ (*b*) $\left(\frac{-5}{3}, \frac{2}{3}, \frac{19}{3}\right)$ (*c*) $\left(\frac{4}{3}, \frac{2}{3}, \frac{11}{3}\right)$ (*d*) None of these

47. **P is the point on the line segment joining the points (3, 2, –1) and (6, 2, –2). If x co-ordinate of P is 5, then its y co-ordinate is**

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

48. **The probability of obtaining an even prime number on each die, when a pair of die is rolled is**

(*a*) 0 (*b*) 1/3 (*c*) 1/12 (*d*) 1/36

49. **Two events A and B will be independent, if**

(*a*) A and B are mutually exclusive. (*b*) $P(A' \cap B') = [1-P(A)][1-P(B)]$

(*c*) $P(A) = P(B)$ (*d*) $P(A) + P(B) = 1$

50. **If A and B are any two events such that $P(A) + P(B) - P(A \text{ and } B) = P(A)$, then**

(*a*) $P(B/A) = 1$ (*b*) $P(A/B) = 1$ (*c*) $P(B/A) = 0$ (*d*) $P(A/B) = 0$