PRACTICE PAPER 7

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

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

Section–A

Choose the correct option:

1. If $A=[x \quad y \quad z], B=\begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}, C=[\alpha \quad \beta \quad \gamma]^T$ then ABC is

   (*a*) Not defined (*b*) 3 × 3 matrix (*c*) 1 × 1 matrix (*d*) 3 × 2 matrix

2. If there are two values of a which makes determinant, $\Delta=\frac{1}{2}\begin{vmatrix} 1 & -2 & 5 \\ 2 & a & -1 \\ 0 & 4 & 2a \end{vmatrix}=86,$ then the sum of these number is

   (*a*) 4 (*b*) 5 (*c*) – 4 (*d*) 9

3. If A is a square matrix such that $(A-2I)(A+I)=0$, then A^{-1} is

   (*a*) $\frac{A-I}{2}$ (*b*) $\frac{A+I}{2}$ (*c*) $2(A-I)$ (*d*) $2(A+I)$

4. If $x=t^2, y=t^3$, then $\frac{d^2y}{dx^2}$ is

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

5. At (0, 0) the curve $y=x^{1/2}$ has

   (*a*) a horizontal tangent parallel to x-axis (*b*) a vertical tangent parallel to y-axis

   (*c*) an oblique tangent (*d*) tangent does not exist.

6. The value of $\int e^x \cos x \, dx$ is

   (*a*) $e^x(\cos x+\sin x)+C$ (*b*) $\frac{e^x}{2}(\cos x+\sin x)+C$

   (*c*) e^x+C (*d*) $(\sin x)e^x+C$

7. The value of $\int e^x\left\{\frac{x^2+1}{(x+1)^2}\right\}dx$ is

(a) $e^x\left(\frac{x+1}{x-1}\right)+C$

(b) $e^x\left(\frac{x}{x-1}\right)+C$

(c) $e^x\left\{\frac{x-1}{x+1}\right\}+C$

(d) None of these

8. **The value of integral $\int \frac{dx}{(x+1)\sqrt{2x-3}}$ is**

(a) $\frac{12}{\sqrt{5}}\tan^{-1}\left(\sqrt{\frac{2x-3}{5}}\right)+C$

(b) $\frac{2}{\sqrt{5}}\tan^{-1}\left(\sqrt{\frac{2x+3}{5}}\right)+C$

(c) $\frac{2}{\sqrt{5}}\tan^{-1}\left(\sqrt{\frac{2x-3}{5}}\right)+C$

(d) $\frac{5}{2}\tan^{-1}\left(\sqrt{\frac{2x-3}{5}}\right)+C$

9. $\int_2^3 \frac{\sqrt{x}\,dx}{\sqrt{5-x}+\sqrt{x}}$ **is equal to**

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) 1 (d) 0

10. **The area of the region bounded by the curve $y^2 = 2px$, $x^2 = 2py$ is**

(a) $\frac{4p^2}{3}$ sq. units (b) $4p^2$ sq. units (c) $\frac{3p^2}{4}$ sq. units (d) None of these

11. **The differential equation for which $y = a\cos x + b\sin x$ is a solution, is**

(a) $\frac{d^2y}{dx^2}+y=0$

(b) $\frac{d^2y}{dx^2}-y=0$

(c) $\frac{d^2y}{dx^2}+(a+b)\,y=0$

(d) $\frac{d^2y}{dx^2}+(a-b)\,y=0$

12. **The general solution of differential equation $(e^x+1)\,y\,dy = (y+1)e^x\,dx$ is**

(a) $(y+1) = k(e^x+1)$

(b) $y+1 = e^x+k$

(c) $y = \log\{k(y+1)(e^x+1)\}$

(d) $y = \log\left(\frac{e^x+1}{y+1}\right)+k$

13. **Solution of LPP maximize $Z = 2x - y$**

subject to $x + y \leq 2$; $x, y \geq 0$ is

(a) 0 (b) 4 (c) 2 (d) none of these

14. **The probability distribution of a discrete random variable X given below:**

X	2	3	4	5
$P(X)$	$7/K$	$5/K$	$11/K$	$9/K$

Then the value of K is

(a) 17 (b) 13 (c) 32 (d) 48

15. **For the binomial distribution $B\left(6, \frac{1}{7}\right)$, standard deviation is**

(a) $\frac{6}{7}$ (b) $\frac{5}{7}$ (c) $\frac{1}{7}$ (d) $\frac{36}{49}$

Section–B (B1)

16. **A relation $R = \{(x, y) : |x - y|$ is divisible by 3; $x, y \in R$; set of real numbers}, then R is**

(*a*) Symmetric (*b*) Reflexive (*c*) Transitive (*d*) All of these

17. **Let $A = \{a, b, c, d\}$ and $R = \{(a, a), (b, b), (a, c), (c, a)\}$ then R is**

(*a*) Reflexive (*b*) Symmetric (*c*) Transitive (*d*) Equivalence

18. **If $f : R \to R$ be given by $f(x) = (3 - x^3)^{\frac{1}{3}}$, then $fof\,(x)$ is**

(*a*) $x^{\frac{1}{3}}$ (*b*) x^3 (*c*) x (*d*) $(3 - x^3)$

19. **If $*$ be a binary operation on $\mathbb{N}$ set of natural numbers as $a * b = b^a$, then $*$ is**

(*a*) Associative (*b*) commutative (*c*) not commutative (*d*) none of these

20. **Let $f : R \to R$ be defined by $f(x) = x^2 + 1$. Then, pre-image of 5 and – 5, respectively are**

(*a*) $\phi, \{-2\}$ (*b*) $\{3, -3\}, \phi$ (*c*) $\{-2, 2\}, \phi$ (*d*) $\{1, -1\}, \{2, -2\}$

21. **The value of $\cot\left[\frac{1}{2}\sin^{-1}\frac{\sqrt{3}}{2}\right]$ is**

(*a*) 1 (*b*) $\frac{1}{\sqrt{3}}$ (*c*) $\sqrt{3}$ (*d*) 0

22. **$\tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{5} + \tan^{-1}\frac{1}{7} + \tan^{-1}\frac{1}{8}$ is equal to**

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

23. **$\sin(\cot^{-1} x)$ is equal to**

(*a*) $\sqrt{1 + x^2}$ (*b*) x (*c*) $(1 + x^2)^{-3/2}$ (*d*) $(1 + x^2)^{-1/2}$

24. **The value of $\sin^{-1}(2x\sqrt{1 - x^2}), x \in \left[\frac{1}{\sqrt{2}}, 1\right]$ is equal to**

(*a*) $2\sin^{-1} x$ (*b*) $2\cos^{-1} x$ (*c*) $-2\sin^{-1} x$ (*d*) $-2\cos^{-1} x$

25. **If $A = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ read the following statements**

Statement I : A^2 will be a zero matrix.

Statement II : A^3 will be a zero matrix.

Choose the correct option.

(*a*) Statement I is correct and II is not correct.

(*b*) Statement II is correct and I is not correct.

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

(*d*) None of these

26. **If $A + B = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ and $A - 2B = \begin{bmatrix} -1 & 1 \\ 0 & -1 \end{bmatrix}$, then A is equal to**

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

27. **What is the maximum value of $\Delta = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1 + \sin\theta & 1 \\ 1 + \cos\theta & 1 & 1 \end{vmatrix}$ where θ is real number?**

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

28. **If A is an invertible matrix of order 2, then $det(A^{-1})$ is equal to**

(*a*) $det\ A$ (*b*) $\frac{1}{det\ A}$ (*c*) 1 (*d*) 0

29. **If $f(x) = \begin{cases} mx + 1, \text{ if } x \le \frac{\pi}{2} \\ \sin x + n, \text{ if } x > \frac{\pi}{2} \end{cases}$, is continuous at $x = \frac{\pi}{2}$ then**

(*a*) $m = 1, n = 0$ (*b*) $m = \frac{n\pi}{2} + 1$ (*c*) $n = \frac{m\pi}{2}$ (*d*) $m = n = \frac{\pi}{2}$

30. **If $y = \log\left(\frac{1 - x^2}{1 + x^2}\right)$, then $\frac{dy}{dx}$ is equal to**

(*a*) $\frac{4x^3}{1 - x^4}$ (*b*) $\frac{-4x}{1 - x^4}$ (*c*) $\frac{1}{4 - x^4}$ (*d*) $\frac{-4x^3}{1-x^4}$

31. **If $y = \sqrt{\sin x + y}$, then $\frac{dy}{dx}$ is equal to**

(*a*) $\frac{\cos x}{2y - 1}$ (*b*) $\frac{\cos x}{1 - 2y}$ (*c*) $\frac{\sin x}{1 - 2y}$ (*d*) $\frac{\sin x}{2y - 1}$

32. **The derivatives of $\cos^{-1}(2x^2 - 1)$ w.r.t. $\cos^{-1} x$ is**

(*a*) 2 (*b*) $\frac{-1}{2\sqrt{1 - x^2}}$ (*c*) $\frac{2}{x}$ (*d*) $1 - x^2$

33. **Let the $f : R \to R$ be defined by $f(x) = 2x + \cos x$, then f**

(*a*) has a maximum, at $x = 0$
(*b*) has a minimum, at $x = \pi$
(*c*) is an increasing function
(*d*) is a decreasing function

34. **$\int \frac{3x - 2}{(x + 1)^2 (x + 3)} dx$ equals to**

(*a*) $\frac{11}{4}\log\left|\frac{x + 1}{x + 3}\right| + \frac{5}{2}\left\{\frac{1}{x + 1}\right\} + C$
(*b*) $\frac{3}{4}\log\left|\frac{x - 1}{x + 3}\right| + \frac{5}{2}\log\left|\frac{x}{3}\right| + C$
(*c*) $\frac{4}{5}\log\left|\frac{x + 1}{x + 3}\right| + \frac{5}{2}\left\{\frac{1}{x - 1}\right\} + C$
(*d*) $\frac{11}{4}\log\left|\frac{x + 1}{x - 3}\right| + \frac{5}{2}\left\{\frac{1}{x + 1}\right\} + C$

35. **The value of integral $\int \sqrt{x^2 + 2x + 6}\, dx$ is**

(*a*) $\frac{1}{2}\{(x + 1)\sqrt{x^2 + 2x + 6} + 5\log|(x + 1) + \sqrt{x^2 + 2x + 6}|\} + C$

(*b*) $\frac{1}{2}\{(x - 1)\sqrt{x^2 + 2x + 6} - 5\log|(x - 1) + \sqrt{x^2 + 2x + 6}|\} + C$

(*c*) $\frac{1}{2}\{(x + 1)\sqrt{x^2 - 2x + 6} + 5\log|(x + 1) + \sqrt{x^2 + 2x + 6}|\} + C$

(*d*) $\frac{1}{2}\{(x + 1)\sqrt{x^2 + 2x + 6} - 5\log|(x + 1) + \sqrt{x^2 + 2x + 6}|\} + C$

36. **If $\{x\}$ represents the fractional part of x, then $\int_0^{100} \{\sqrt{x}\}\, dx$ is equal to**

(*a*) $\frac{200}{3}$ (*b*) $-\frac{5}{4}$ (*c*) 100 (*d*) 0

37. **The area of the region bounded by the curves $y = x^3$, $y = x + 6$ and $x = 0$ is**

(*a*) 7 sq. units (*b*) 6 sq. units (*c*) 10 sq. units (*d*) 14 sq. units

38. **The curve for which the slope of the tangent at any point is equal to the ratio of the abscissa to the ordinate of the point is**

(*a*) an ellipse (*b*) parabola (*c*) circle (*d*) hyperbola

39. **The solution of differential equation** $\frac{dy}{dx}+\frac{2x}{(1+x^2)}y=\frac{1}{(1+x^2)^2}$ **is**

(*a*) $y(1+x^2)=C+\tan^{-1}x$ (*b*) $\frac{y}{1+x^2}=C+\tan^{-1}x$

(*c*) $y\log(1+x^2)=C+\tan^{-1}x$ (*d*) $y(1+x^2)=C+\sin^{-1}x.$

40. **If** $\vec{a}\perp\vec{b}$ **then** $\vec{a}\times\{\vec{a}\times\{\vec{a}\times\{\vec{a}\times\{a\times(\vec{a}\times\vec{b})\}\}\}\}$ **equals**

(*a*) $-|\vec{a}|^2\vec{b}$ (*b*) $|\vec{a}|^6\vec{b}$ (*c*) $-|\vec{a}|^6\vec{b}$ (*d*) $|\vec{a}|^2\vec{b}$

41. **If** $\vec{a},\vec{b},\vec{c}$ **are vectors such that** $\vec{c}=\vec{a}+\vec{b}$ **and** $\vec{a}\cdot\vec{b}=0$ **then**

(*a*) $a^2+b^2+c^2=0$ (*b*) $a^2-b^2=c^2$ (*c*) $a^2+b^2=c^2$ (*d*) $\vec{c}=\vec{a}\times\vec{b}$

42. **If** $\vec{a'_1},\vec{a'_2},\vec{a'_3}$ **are reciprocal of the non-coplanar vector** $\vec{a}_1,\vec{a}_2,\vec{a}_3$ **then** $[\vec{a}_1\,\vec{a}_2\,\vec{a}_3][\vec{a'_1},\vec{a'_2},\vec{a'_3}]$ **equals**

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

43. **Let** a, b, c **be distinct and non-negative numbers. If the vectors** $a\hat{i}+a\hat{j}+c\hat{k}$, $\hat{i}+\hat{k}$ **and** $c\hat{i}+c\hat{j}+b\hat{k}$ **lie in a plane, then** c **is**

(*a*) AM of *a* and *b* (*b*) GM of *a* and *b* (*c*) Zero (*d*) None of these

44. **The angle between the lines whose direction cosines are given by the equation** $l+m+n=0$ **and** $l^2+m^2-n^2=0$ **is**

(*a*) $\theta=\frac{\pi}{4}$ (*b*) $\theta=\frac{\pi}{2}$ (*c*) $\theta=\frac{\pi}{3}$ (*d*) $\theta=\pi$

45. **The equation of the plane through the points (2, 1, –1), (–1, 3, 4) and perpendicular to the plane** $x-2y+4z=10$ **is**

(*a*) $18x+17y+4z=49$ (*b*) $20x-12y+3z=11$ (*c*) $3x-2y-4z=17$ (*d*) $7x-2y-3z=0$

46. **The equation of the plane which bisects perpendicularly the line joining the points** *A* **(2, 3, 4) and** *B* **(4, 5, 8) at right angles is**

(*a*) $x-y+2z=7$ (*b*) $x+y+2z=19$ (*c*) $x-y-2z=19$ (*d*) $-x+2y-3z=7$

47. **The equation of a plane which is at a distance** $3\sqrt{3}$ **units from origin and the normal to which is equally inclined to coordinate axes is**

(*a*) $x+y-z=9$ (*b*) $x+y+z=9$ (*c*) $x-2y-z=1$ (*d*) $x-5y-3z=7$

48. **If** $P(A)=0.4$, $P(B)=p$, $P(A\cup B)=0.6$ **and** *A, B* **are independent events, the value of** p **is**

(*a*) $\frac{17}{19}$ (*b*) $\frac{1}{3}$ (*c*) 0 (*d*) None of these

49. *A* **can solve 90% of the problems given in a book and** *B* **can solve 70%. The probability that at least one of them will solve the problem, selected at random from the book is**

(*a*) 0.02 (*b*) 0.97 (*c*) 0.005 (*d*) 0.5

50. **The probability that a teacher will give an un-announced test during any class meeting is 1/5. If a student is absent twice, the probability that he will miss atleast one test is**

(*a*) $\frac{9}{25}$ (*b*) $\frac{7}{17}$ (*c*) $\frac{11}{25}$ (*d*) $\frac{11}{17}$