PRACTICE PAPER 17

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

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

Section–A

Choose the correct option:

1. If $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$, then A^2 is

   (*a*) 27 A (*b*) 2 A (*c*) 3 A (*d*) I

2. If area of a triangle is 35 square units with vertices (2, – 6), (5, 4) and (k, 4) then k is

   (*a*) 12 (*b*) – 2 (*c*) – 12, – 2 (*d*) 12, – 2

3. If $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, then A^n equals

   (*a*) $\begin{bmatrix} 3n & -4n \\ n & -n \end{bmatrix}$ (*b*) $\begin{bmatrix} 3^n & 4^n(-1)^n \\ 1^n & (-1)^n \end{bmatrix}$ (*c*) $\begin{bmatrix} 3+n & -(4+n) \\ n & -n \end{bmatrix}$ (*d*) None of these

4. If $f(x) = \log \cos x$ then $f''\left(\frac{\pi}{4}\right)$ equal to

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

5. At $x = \frac{5\pi}{6}$, $f(x) = 2 \sin 3x + 3 \cos 3x$ is

   (*a*) 0 (*b*) minimum (*c*) maximum (*d*) none of these

6. *Read the following statements.*

   Statement I : Integral of $\int_1^{\sqrt{3}} \frac{dx}{1+x^2} dx$ is $\frac{\pi}{12}$.

   Statement II : $\int_0^{2a} f(x)dx = \int_0^a f(x)dx + \int_0^a f(2a-x)dx$

   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

7. If $f(a+b-x)=f(x)$, then $\int_a^b xf(x)\,dx$ is equal to

(*a*) $\frac{a+b}{2}\int_a^b f(b-x)dx$ (*b*) $\frac{a+b}{2}\int_a^b f(b+x)\,dx$ (*c*) $\frac{b-a}{2}\int_a^b f(x)\,dx$ (*d*) $\frac{a+b}{2}\int_a^b f(x)\,dx$

8. The value of $\int \frac{\cos^2 x-\cos 2x}{1-\cos x}dx$ equals

(*a*) $x+\sin x+C$ (*b*) $x-2\sin x+C$ (*c*) $-x+2\cos x+C$ (*d*) $x-2\cos x+C$

9. $\int \frac{e^x(1+x)\,dx}{\cos^2(xe^x)}$ is equal to

(*a*) $-\cot(e^x)+C$ (*b*) $\tan(xe^x)+C$ (*c*) $\tan(e^x)+C$ (*d*) $\cot(e^x)+C$

10. The area bounded by the curve $y=\sin^{-1}x$ and the line $x=0$ and $|y|=\frac{\pi}{2}$ is (in square units)

(*a*) 1 (*b*) 2 (*c*) π (*d*) 2π

11. The differential equation representing the family of curves $y^2=2C(x+\sqrt{C})$; where C is positive parameter, is of

(*a*) Order 1 and degree 3 (*b*) Order 2, degree 2
(*c*) Degree 3, order 3 (*d*) Degree 4, order 4

12. The equation of the curve whose slope at any point different from origin is $y+\frac{y}{x}$, is

(*a*) $y=Cxe^x, C\neq 0$ (*b*) $y=xe^x$ (*c*) $xy=e^x$ (*d*) $y+xe^x=C$

13. By the graphical method, the solution of LPP

Maximize $Z=3x_1+5x_2$

subject to $3x_1+2x_2\leq 18$

$x_1\leq 4$

$x_2\leq 6$

$x_1, x_2\geq 0$ is

(*a*) $x_1=2, x_2=0, Z=6$ (*b*) $x_1=2, x_2=6, Z=36$

(*c*) $x_1=4, x_2=3, Z=27$ (*d*) $x_1=4, x_2=6, Z=42$

14. The sum and product of mean and variance of a Binomial distribution are 24 and 128 respectively then the value of n is

(*a*) 16 (*b*) 32 (*c*) 24 (*d*) none of these

15. The probability distribution of a random variable X is given below

X	0	1	2	3
$P(X)$	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{8}$

then the mean is

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

Section–B(B1)

16. A relation R in the set of non-zero complex numbers is defined by $z_1 R\, z_2 \Leftrightarrow \frac{z_1-z_2}{z_1+z_2}$ is real, then R is

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

17. Number of onto (surjective) functions from A to B if $n(A) = 6$ and $n(B) = 3$ are

(a) $2^6 - 2$ (b) $3^6 - 3$ (c) 340 (d) None of these

18. Let $A = \{7, 8, 9, 10\}$ and $R\ \{(8, 8), (9, 9), (10, 10), (7, 8)\}$ be a relation on A, then R is

(a) Transitive (b) Reflexive (c) Symmetric (d) None of these

19. If $f(x) = \dfrac{3x+2}{5x-3}$ then

(a) $f^{-1}(x) = -f(x)$ (b) $f^{-1}(x) = f(x)$ (c) $(fof)(x) = x$ (d) $f^{-1}(x) = -\dfrac{1}{19}f(x)$

20. Let * be a binary operation on Q – {0} such that $a * b = \dfrac{a}{b}$ then $(2 * 3) * 5$ is equal to

(a) $\dfrac{2}{5}$ (b) $\dfrac{3}{5}$ (c) $\dfrac{3}{15}$ (d) $\dfrac{2}{15}$

21. The domain of the function $y = \sin^{-1}(-x^2)$ is

(a) [0, 1] (b) (0, 1) (c) [–1, 1] (d) None of these

22. $2\tan^{-1}\{\text{cosec}(\tan^{-1}x) - \tan(\cot^{-1}x)\}$ is equal to

(a) $\sin^{-1} x$ (b) $\tan^{-1} x$ (c) $\cot^{-1}\dfrac{1}{x}$ (d) none of these

23. If $ax + b\{\sec(\tan^{-1}x)\} = c$ and $ay + b\{\sec(\tan^{-1}y)\} = c$, then $\dfrac{x+y}{1-xy} =$

(a) $\dfrac{2ac}{a-c}$ (b) $\dfrac{ac}{a^2+c^2}$ (c) $\dfrac{2ac}{a^2-c^2}$ (d) $\dfrac{a+c}{1-ac}$

24. The positive integral solution of the equation $\tan^{-1}x + \cos^{-1}\dfrac{y}{\sqrt{1+y^2}} = \sin^{-1}\dfrac{3}{\sqrt{10}}$ is

(a) $x = -2, y = -1$ (b) $x = 2, y = 2$ (c) $x = 2, y = -2$ (d) $x = 1, y = 2$

25. A matrix $A = [a_{ij}]_{n \times n}$ is said to be skew symmetric if

(a) $a_{ij} = 0$ (b) $a_{ij} = -a_{ji}$ (c) $a_{ij} = a_{ji}$ (d) $a_{ij} = 1$

26. If A and B are two matrices such that $AB = B$ and $BA = A$, then $A^2 + B^2 =$

(a) $2BA$ (b) $2AB$ (c) $A + B$ (d) AB

27. If $\Delta_1 = \begin{vmatrix} Ax & x^2 & 1 \\ By & y^2 & 1 \\ Cz & z^2 & 1 \end{vmatrix}$ and $\Delta_2 = \begin{vmatrix} A & B & C \\ x & y & z \\ zy & zx & xy \end{vmatrix}$ then $\Delta_1 - \Delta_2$ is equal to

(a) 1 (b) 0 (c) $2\Delta_1$ (d) none of these

28. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 2 \\ 3 & -1 & 9 \end{bmatrix}$, then the value of det (adj (adj A)) equals

(a) 11 (b) 121 (c) 1331 (d) 14641

29. If $f(x) = x^n$, then the value of $f(1) + \dfrac{f(1)}{1!} + \dfrac{f^2(1)}{2!} + \dfrac{f^3(1)}{3!} + \ldots\ldots\ldots + \dfrac{f^n(1)}{n!}$, where $f^r(1)$ is the r^{th} derivative of $f(x)$ w.r.t. x is

(a) 1 (b) n (c) 2^n (d) none of these

30. Let $f(x) = \begin{vmatrix} x^3 & \sin x & \cos x \\ 6 & -1 & 0 \\ p & p^2 & p^3 \end{vmatrix}$, where p is constant, then $f'''(0)$

(a) p (b) 0 (c) $p + p^3$ (d) $p + p^2$

MATHEMATICS

31. **The function $f(x) = |x| + |x - 1|$ is**

(*a*) $f(x)$ is continuous at $x = 0$ as well as at $x = 1$.

(*b*) $f(x)$ is continuous at $x = 1$ but not at $x = 0$

(*c*) $f(x)$ is discontinuous at $x = 0$ as well as at $x = 1$.

(*d*) none of these

32. **If $y = f\left(\frac{3x+4}{5x+6}\right)$ and $f'(x) = \tan x^2$ then $\frac{dy}{dx}$ is equal to**

(*a*) $-2\tan\left(\frac{3x+4}{5x+6}\right)^2 \times \frac{1}{(5x+6)^2}$ (*b*) $\tan x^2$

(*c*) $f\left(\frac{3\tan x^2+4}{5\tan x^2+6}\right)$ (*d*) none of these

33. **The slope of tangent to the curves $x = t^2 + 3t - 8$, $y = 2t^2 - 2t - 5$ at the point $(2, -1)$ is**

(*a*) $\frac{22}{7}$ (*b*) $\frac{6}{7}$ (*c*) $\frac{7}{6}$ (*d*) $\frac{-6}{7}$

34. ***Read the following statements.***

Statement I : The integral of $\int \frac{dx}{\sqrt{9x-4x^2}}$ is equal to $\frac{1}{2}\sin^{-1}\left(\frac{8x+9}{9}\right) + C$.

Statement II : The integral of $\int e^x\left(\frac{1-x}{(1+x^2)}\right)^2 dx$ is equal to $\frac{e^x}{1+x^2}$.

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

35. **The value of $\int_{0}^{1} \tan^{-1}\left(\frac{2x-1}{1+x-x^2}\right)dx$ is**

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

36. **If $f(x) = \frac{e^x}{1+e^x}$, $I_1 = \int_{f(-a)}^{f(a)} xg\{x(1-x)\}dx$ and $I_2 = \int_{f(-a)}^{f(a)} g\{x(1-x)\}dx$, then the value of $\frac{I_2}{I_1}$ is**

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

37. **If the area enclosed by $y^2 = 4ax$ and line $y = ax$ is $\frac{1}{3}$ sq. unit, then the area enclosed by $y = 4x$ with same parabola is**

(*a*) 8 sq. units. (*b*) 4 sq. units. (*c*) $\frac{4}{3}$ sq. units. (*d*) $\frac{8}{3}$ sq. units.

38. **If $y + \frac{d}{dx}(xy) = x(\sin x + \log x)$, then**

(*a*) $y = \cos x + \frac{2}{x}\sin x + \frac{2}{x^2}\cos x + \frac{x}{3}\log x - \frac{x}{9} + \frac{C}{x^2}$

(*b*) $y = -\cos x - \frac{2}{x}\sin x + \frac{2}{x^2}\cos x + \frac{x}{3}\log x - \frac{x}{9} + \frac{C}{x^2}$

(*c*) $y = -\cos x + \frac{2}{x}\sin x + \frac{2}{x^2}\cos x - \frac{x}{3}\log x - \frac{x}{9} + \frac{C}{x^2}$

(*d*) None of these

39. **The general solution of the differential equation**

$(1 + \tan y)(dx - dy) + 2xdy = 0$ is

(*a*) $x(\sin y + \cos y) = \sin y + Ce^{y}$ (*b*) $x(\sin y + \cos y) = \sin y + Ce^{-y}$

(*c*) $y(\sin x + \cos x) = \sin x + Ce^{x}$ (*d*) None of these

40. **If $|\vec{a}| = 4$ and $-3 \le \lambda \le 2$, then the range of $|\lambda \vec{a}|$ is**

(*a*) [0, 8] (*b*) [–12, 8] (*c*) [0, 12] (*d*) [8, 12]

41. **The number of vectors of unit length perpendicular to the vectors $\vec{a} = 2\hat{i} + \hat{j} + 2\hat{k}$ and $\vec{b} = \hat{j} + \hat{k}$ is**

(*a*) one (*b*) two (*c*) three (*d*) infinite

42. **If $\vec{r}\cdot\vec{a} = 0, \vec{r}\cdot\vec{b} = 0$ and $\vec{r}\cdot\vec{c} = 0$ for some non-zero vector $\vec{r}$, then the value of $\vec{a}\cdot(\vec{b}\times\vec{c})$ is**

(*a*) 1 (*b*) 2 (*c*) 0 (*d*) –1

43. **The vectors $\vec{a} = 3\hat{i} - 2\hat{j} + 2\hat{k}$ and $\vec{b} = -\hat{i} - 2\hat{k}$ are the adjacent sides of a parallelogram. The angle between its diagonal is**

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

44. **The image of the point (–2, 1, –2) in the line $\frac{x-3}{2} = \frac{y+2}{3} = \frac{z-1}{2}$ is**

(*a*) $\left(\frac{108}{17}, \frac{-127}{17}, \frac{40}{17}\right)$ (*b*) $\left(\frac{-108}{17}, \frac{127}{17}, \frac{40}{17}\right)$ (*c*) $\left(\frac{108}{17}, \frac{127}{17}, \frac{-40}{17}\right)$ (*d*) $\left(\frac{108}{17}, \frac{-127}{17}, \frac{-40}{17}\right)$

45. **The co-ordinates of the point where the line containing the points (– 4, – 5, 3) and (– 3, 1, 2) crosses the plane determined by the points *P*(2, 3, 1), *Q*(2, 1, 2) and *R*(3, 6, –1) is**

(*a*) (–2, 7, –1) (*b*) (2, 7, 1) (*c*) (– 2, 7, 1) (*d*) (2, 7, – 1)

46. **The distance of the point (4, 5, 3) from plane $x + y + z = 2$ measured parallel to the line $x = y = 2z$ is**

(*a*) 6 units (*b*) 5 units (*c*) 7 units (*d*) None of these

47. **The equation of line passing through the point (2, 1, – 4) and perpendicular to the lines**

$\frac{x+9}{-16} = \frac{y-8}{8} = \frac{z-10}{7}$ and $\frac{x-29}{8} = \frac{y-15}{3} = \frac{z-5}{-5}$ is

(*a*) $\frac{x-2}{61} = \frac{y-15}{3} = \frac{z-5}{-5}$ (*b*) $\frac{x-2}{61} = \frac{y-1}{24} = \frac{z+4}{112}$

(*c*) $\frac{x-2}{61} = \frac{y-1}{24} = \frac{z-4}{112}$ (*d*) $\frac{x-2}{61} = \frac{y+1}{24} = \frac{z+4}{112}$

48. **A coin is tossed $(2n + 1)$ times, the probability that head appear odd number of times is**

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

49. **For a binomial distribution mean is 9 and SD is $\frac{3}{2}$, then the value of n equals**

(*a*) 12 (*b*) 36 (*c*) 9 (*d*) none of these

50. **A function is randomly selected from the functions of set *S* where $S = \{1, 2, 3, ..., m\}$ to itself, if probability that it is one to one is $\frac{24}{625}$, then m equals**

(*a*) 6 (*b*) 5 (*c*) 4 (*d*) none of these