6 PRACTICE PAPER

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

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

Section–A

Choose the correct option:

1. **The matrix** $\begin{bmatrix} 0 & 5 & -7 \\ -5 & 0 & 11 \\ 7 & -11 & 0 \end{bmatrix}$ **is known as**

   (*a*) Upper triangular matrix (*b*) Skew symmetric matrix
   (*c*) Symmetric matrix (*d*) Diagonal matrix

2. **If** $A = \begin{bmatrix} 1 & 2 \\ 4 & 2 \end{bmatrix}$**, then the value of** k **if** $|2A| = k|A|$ **is**

   (*a*) 4 (*b*) – 4 (*c*) 3 (*d*) 0

3. **If** $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ **and** $A\,(adj\ A) = \begin{bmatrix} k & 0 \\ 0 & k \end{bmatrix}$**, then the value of** k **is**

   (*a*) 1 (*b*) –1 (*c*) 0 (*d*) 2

4. **If** $f(x) = e^x$ **then** $f''(5)$ **is equal to**

   (*a*) e (*b*) e^5 (*c*) e^4 (*d*) None of these

5. **Let the parabolas** $y = x^2 + ax + b$ **and** $y = x(c - x)$ **touch each other at the point (1, 0). Then**

   (*a*) $a = -3$ (*b*) $b = 1$ (*c*) $c = 2$ (*d*) $b = -2$

6. **The value of** $\int \frac{2x\,dx}{\sqrt{1 - x^2 - x^4}}$ **equals**

   (*a*) $\sin^{-1}\left(\frac{2x^2+1}{\sqrt{5}}\right) + C$ (*b*) $\cos^{-1}\left(\frac{2x^2+1}{\sqrt{5}}\right) + C$

   (*c*) $\log\left(\frac{2x^2+1}{\sqrt{5}}\right) + C$ (*d*) $\sin^{-1}\left(\frac{2x^2-1}{\sqrt{5}}\right) + C$

7. **The value of** $\int \frac{\cos x\,dx}{\sqrt{\sin^2 x - 2\sin x - 3}}$ **equals**

(a) $\log\left|(\sin x - 1) + \sqrt{\sin^2 x - 2\sin x - 3}\right| + C$ (b) $\log\left|(\sin x - 1) - \sqrt{\sin^2 x - 2\sin x - 3}\right| + C$

(c) $\log\left|(\sin x + 1) + \sqrt{\sin^2 x + 2\sin x - 3}\right| + C$ (d) $\log\left|\sin x - 2\right| + C$

8. The integral value of $\int_0^{\frac{\pi}{2}} \frac{\tan x \, dx}{1 + m^2 \tan^2 x}$ is

(a) $\frac{\log m}{m^2 - 1}$ (b) $\log\left(\frac{m^2 - m}{2}\right)$ (c) $\log 3m$ (d) 0

9. $\int_1^{\sqrt{3}} \frac{dx}{1 + x^2}$ is equal to

(a) $\frac{\pi}{3}$ (b) $\frac{2\pi}{3}$ (c) $\frac{\pi}{6}$ (d) $\frac{\pi}{12}$

10. The area of the region included between the parabola $y = \frac{3x^2}{4}$ and the line $3x - 2y + 12 = 0$ is

(a) 20 sq. units (b) 12 sq. units (c) 8 sq. units (d) 27 sq. units

11. The differential equation of the family of curves $x^2 + y^2 - 2ay = 0$, where a is arbitrary constant, is

(a) $(x^2 - y^2)\, y' = 2xy$ (b) $2(x^2 + y^2)\, y' = xy$ (c) $2(x^2 - y^2)\, y' = xy$ (d) $(x^2 + y^2)\, y' = 2xy$

12. The general solution of $(2y - 1)\, dx - (2x + 3)\, dy = 0$ is

(a) $\frac{2x - 1}{2y + 3} = k$ (b) $\frac{2y + 1}{2x - 3} = k$

(c) $\frac{2x + 3}{2y - 1} = k$ (d) $\frac{2x - 1}{2y - 1} = k$

13. Which of the following is not a convex set?

(a) $\{(x, y) \mid 2x + 5y < 7\}$ (b) $\{(x, y) \mid x^2 + y^2 \le 4\}$

(c) $\{x : |x| = 5\}$ (d) $\{(x, y) \mid 3x^2 + 2y^2 \le 6\}$

14. Suppose a random variable X follows the binomial distribution with parameters n and p, where $0<p<1$. If $P(X = r)/P(X = n - r)$ is independent of n and r, then p equals to

(a) $\frac{1}{2}$ (b) $\frac{11}{3}$ (c) $\frac{2}{5}$ (d) $\frac{3}{7}$

15. For the binomial distribution $B\left(6, \frac{1}{3}\right)$, the variance is

(a) $\frac{4}{3}$ (b) 2 (c) 4 (d) None of these

Section–B (B1)

16. If a relation R on the set $\{1, 2, 3\}$ be defined by $R = \{(1, 2)\}$, then R is

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

17. Let * be binary operation on $\mathbb{R}$ given by $a * b = b - a + 1$ then $(5 * 4)$ is equal to

(a) 1 (b) 0 (c) 2 (d) None of these

18. Let the function $f : R \to R$ be defined by $f(x) = 2x + \sin x$ for $x \in R$. Then f is

(a) one-one but not onto (b) onto but not one-one

(c) neither one-one nor onto (d) one-one and onto

19. Let $f(x) = \begin{cases} x + 1, & x \le 1 \\ 2x + 1, & 1 < x \le 2 \end{cases}$ and $g(x) = \begin{cases} x^2, & -1 \le x < 2 \\ x + 2, & 2 \le x \le 3 \end{cases}$ then $fog(x)$ is

(a) $fog(x) = \begin{cases} x^2, & -1 \le x < 2 \\ x + 2, & 2 \le x < 3 \end{cases}$ (b) $fog(x) = \begin{cases} x^2 + 1, & -1 \le x < 2 \\ x + 2, & 2 \le x \le 3 \end{cases}$

(c) $fog(x)=\begin{cases} x^2+1, & x\le 1\\ 2x^2+1, & 1<x\le\sqrt{2}\end{cases}$ (d) $fog(x)=\begin{cases} x^2, & -1\le x<2\\ x+2, & 2\le x\le 3\end{cases}$

20. Let $f:R-\left\{-\frac{4}{3}\right\}\to R$ be a function defined as $f(x)=\frac{4x}{3x+4}$. The inverse of f is the map g : Range $f\to R-\left\{-\frac{4}{3}\right\}$ given by

(a) $g(y)=\frac{3y}{3-4y}$ (b) $g(y)=\frac{4y}{4-3y}$ (c) $g(y)=\frac{4y}{3-4y}$ (d) $g(y)=\frac{3y}{4-3y}$

21. The value of $\sec^{-1}\left(\sec\frac{4\pi}{3}\right)$ is

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

22. The value of $\cos^{-1}(-1)+\sin^{-1}(1)$ is

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

23. If $\sin^{-1}\frac{5}{x}+\sin^{-1}\frac{12}{x}=\frac{\pi}{2}$, then value of x is

(a) 13 (b) -13 (c) ± 13 (d) 26

24. The value of $\cos(2\cos^{-1}x+\sin^{-1}x)$ at $x=\frac{1}{3}$ is

(a) $\frac{-2\sqrt{2}}{3}$ (b) $\frac{2\sqrt{3}}{5}$ (c) $\frac{\pm 2\sqrt{2}}{3}$ (d) 0

25. The number of all possible matrices of order 2×3 with each entry 1 or -1 is

(a) 32 (b) 12 (c) 6 (d) 64

26. If A is of order $m\times n$ and B is of order $p\times q$, then AB is defined only if

(a) $m=q$ (b) $m=p$ (c) $n=p$ (d) $n=q$

27. The determinant $\begin{vmatrix} b^2-ab & b-c & bc-ac\\ ab-a^2 & a-b & b^2-ab\\ bc-ac & c-a & ab-a^2\end{vmatrix}$ equals to

(a) $abc(b-c)(c-a)(a-b)$ (b) $(b-c)(c-a)(a-b)$

(c) $(a+b+c)(b-c)(c-a)(a-b)$ (d) None of these

28. If $A=\begin{bmatrix} 2 & 3\\ 5 & -2\end{bmatrix}$ be such that $A^{-1}=KA$, then value of K is

(a) $\frac{1}{19}$ (b) 1 (c) -19 (d) $\frac{-1}{19}$

29. The values of a so that the function $f(x)$ defined by

$$f(x)=\begin{cases}\frac{\sin^2 ax}{x^2}, & x\ne 0\\ 1, & x=0\end{cases}$$ may be continuous at $x=0$ is

(a) ± 1 (b) 1 (c) -1 (d) None of these

30. The value of $\log_x 2$ with respect to x is

(a) $\frac{-1}{(\log_2 x)^2}\times\frac{1}{x\log_e 2}$ (b) 0 (c) $\frac{1}{\log x}$ (d) $\frac{1}{\log 2}$

31. **If $f(x) = x^2 + 2x + 7$ then value of $f'(3)$ is**

(*a*) 18 (*b*) 8 (*c*) 10 (*d*) 3

32. **The set of points where the function f given by $f(x) = |2x - 1| \sin x$ is differentiable is**

(*a*) R (*b*) $R - \left\{\frac{1}{2}\right\}$ (*c*) $(0, \infty)$ (*d*) none of these

33. **The minimum value of $f(x) = 3\cos^2 x + 4\sin^2 x + \cos\frac{x}{2} + \sin\frac{x}{2}$ is**

(*a*) 4 (*b*) $3 + \sqrt{2}$ (*c*) $4 + \sqrt{2}$ (*d*) none of these

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

(*a*) $\frac{1}{2}\log|x-1| - \frac{1}{4}\log|x^2+1| + \frac{1}{2}\tan^{-1}x + C$

(*b*) $\frac{1}{2}\log|x+1| + \frac{1}{4}\log|x^2-1| + \frac{1}{2}\tan^{-1}x + C$

(*c*) $\log|x-1| + \frac{1}{4}\log|x^2+1| + \frac{1}{2}\tan^{-1}x + C$

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

35. $\int_0^{\frac{2}{3}} \frac{dx}{4+9x^2}$ **is equal to**

(*a*) $\frac{\pi}{6}$ (*b*) $\frac{\pi}{12}$ (*c*) $\frac{\pi}{24}$ (*d*) $\frac{\pi}{4}$

36. $\int_{\frac{1}{3}}^{1} \frac{(x-x^3)^{1/3}\,dx}{x^4}$ **is equal to**

(*a*) 6 (*b*) 0 (*c*) 3 (*d*) 4

37. **The area of a minor segment of the circle $x^2 + y^2 = a^2$ cut off by the line $x = \frac{a}{2}$ is**

(*a*) $\frac{a^2}{12}(4\pi - 3\sqrt{3})$ sq. units

(*b*) $\frac{a^2}{4}(4\pi - 3)$ sq. units

(*c*) $\frac{a^2}{12} \times (3\pi - 4)$ sq. units

(*d*) None of these

38. **The solution of differential equation $\frac{dy}{dx} + \frac{y}{x} = \sin x$ is**

(*a*) $x(y + \cos x) = \sin x + C$

(*b*) $x(y - \cos x) = \sin x + C$

(*c*) $xy\cos x = \sin x + C$

(*d*) $x(y + \cos x) = \cos x + C$

39. **The general solution of the differential equation of the type $\frac{dx}{dy} + Px = Q$ is given by**

(*a*) $ye^{\int P dy} = \int (Qe^{\int P dy})\,dy + C$

(*b*) $ye^{\int P dx} = \int (Qe^{\int P dx})\,dx + C$

(*c*) $xe^{\int P dy} = \int (Qe^{\int P dy})\,dy + C$

(*d*) $xe^{\int P dx} = \int Qe^{\int P dx}\,dx + C$

40. **The value of λ for which the volume of tetrahedron, whose vertices have position vector $\hat{i} - 5\hat{j} + 9\hat{k}$, $-\hat{i} - 2\hat{j} + 7\hat{k}$, $4\hat{i} - \hat{j} + \lambda\hat{k}$ and $7\hat{i} - 4\hat{j} + 7\hat{k}$ is 6 cubic units, is**

(*a*) 7 (*b*) 6 (*c*) 8 (*d*) 9

41. **If $\vec{\alpha} + \vec{\beta} + \vec{\gamma} = a\vec{\delta}$, $\vec{\beta} + \vec{\gamma} + \vec{\delta} = b\vec{\alpha}$ and $\vec{\alpha}, \vec{\beta}, \vec{\gamma}$ are non coplanar and $\vec{\alpha}$ is not parallel to $\vec{\delta}$ then the value of $\vec{\alpha} + \vec{\beta} + \vec{\gamma} + \vec{\delta}$ is**

(*a*) 2 (*b*) 3 (*c*) 1 (*d*) 0

42. **If $\vec{a}, \vec{b}, \vec{c}$ are the position vectors of vertices *A*, *B* and *C* of a triangle then the area of the triangle is given by**

(*a*) $\vec{a}\times\vec{b}+\vec{b}\times\vec{c}+\vec{c}\times\vec{a}$ (*b*) $\frac{1}{2}[\vec{a}\ \vec{b}\ \vec{c}]$ (*c*) $\frac{1}{2}|\vec{a}\times\vec{b}+\vec{b}\times c+\vec{c}\times\vec{a}|$ (*d*) None of these

43. **If *D*, *E* and *F* are mid points of the sides *BC*, *CA* and *AB* respectively of a triangle *ABC*, then $\overrightarrow{AD}+\overrightarrow{BE}+\overrightarrow{CF}$ is equal to**

(*a*) 0 (*b*) 1 (*c*) 2 (*d*) None of these

44. **The intercepts made by the plane $2x-3y+5z+4=0$ on the coordinate axes are**

(*a*) $-2, \frac{4}{3}$ and $-\frac{4}{5}$ (*b*) $-2, -\frac{4}{3}$ and $\frac{4}{5}$ (*c*) $\frac{4}{3}, -\frac{4}{3}$ and $\frac{7}{3}$ (*d*) $-2, -\frac{4}{3}$ and $-\frac{4}{5}$

45. **The angle between the line $(5\hat{i}-\hat{j}-4\hat{k})+\lambda(2\hat{i}-\hat{j}+\hat{k})$ and the plane $\vec{r}.(3\hat{i}-4\hat{j}-\hat{k})+5=0$ is**

(*a*) $\sin^{-1}\left(\frac{5}{2\sqrt{91}}\right)$ (*b*) $\sin^{-1}\left(\frac{9}{2\sqrt{39}}\right)$ (*c*) $\sin^{-1}\left(\frac{7}{3\sqrt{80}}\right)$ (*d*) None of these

46. **The vector equation of the line $\frac{x-5}{3}=\frac{y+4}{7}=\frac{z-6}{2}$ is**

(*a*) $\vec{r}=(5\hat{i}-4\hat{j}+6\hat{k})+\lambda(3\hat{i}+7\hat{j}+2\hat{k})$ (*b*) $\vec{r}=(5\hat{i}-3\hat{j}-2\hat{k})+\lambda(2\hat{i}+6\hat{j}-3\hat{k})$

(*c*) $\vec{r}=(5\hat{i}-3\hat{j}-2\hat{k})+\lambda(3\hat{i}-7\hat{j}-2\hat{k})$ (*d*) None of the above

47. **If *O* is the origin and *A* is (*a*, *b*, *c*), then the direction cosines of the line *OA* and the equation of plane through *A* at right angle to *OA* is**

(*a*) $ax+by+cz=a^2-b^2-c^2$ (*b*) $ax+by+cz=a^2+b^2+c^2$

(*c*) $ax-by+cz=a^2+b^2-c^2$ (*d*) None of these

48. **Let *A* and *B* be two events. If $P(A)=0.2$, $P(B)=0.4$, $P(A\cup B)=0.6$, then $P(A/B)$ is equal to**

(*a*) 0.8 (*b*) 0.3 (*c*) 0 (*d*) 0.5

49. **Let *A* and *B* be two events such that $P(A)=0.6$, $P(B)=0.2$ and $P(A/B)=0.5$ then $P(A'/B')$ equals**

(*a*) $\frac{1}{10}$ (*b*) $\frac{3}{10}$ (*c*) $\frac{3}{8}$ (*d*) $\frac{6}{7}$

50. **Let *X* be a discrete random variable. The probability distribution of *X* is given below.**

X	30	10	–10
P(*X*)	$\frac{1}{5}$	$\frac{3}{10}$	$\frac{1}{2}$

E(*X*) equals to

(*a*) 6 (*b*) 4 (*c*) 3 (*d*) –5