FIRST REVISION EXAMINATION - 2025

CLASS:XII **MATHEMATICS** Reg.No

Time : 3.00 Hours **Maximum Marks : 90**

SECTION – A

Note:

(i) All questions are compulsory. **20 x 1= 20**

(ii) Each question carries one mark.

(iii) Choose the most suitable answer from the given four alternatives

1. If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ be such that $\lambda A^{-1} = A$, then λ is

(1)17 (2)14 (3)19 (4)21

2. The principal argument of $\frac{3}{-1+i}$ is

(1)$\frac{-5\pi}{6}$ (2)$\frac{-2\pi}{3}$ (3)$-\frac{3\pi}{4}$ (4)$\frac{-\pi}{2}$

3. The number of real numbers in $[0, 2\pi]$ satisfying $\sin^4 x - 2\sin^2 x + 1$ is

(1)2 (2)4 (3)1 (4)∞

4. If $\cot^{-1} 2$ and $\cot^{-1} 3$ are two angles of a triangle, then the third angle is

(1)$\frac{\pi}{4}$ (2)$\frac{3\pi}{4}$ (3)$\frac{\pi}{6}$ (4)$\frac{\pi}{3}$

5. If $x + y = k$ is a normal to the parabola $y^2 = 12x$, then the value of k is

(1)3 (2)-1 (3)1 (4)9

6. The eccentricity of the ellipse $(x-3)^2 + (y-4)^2 = \frac{y^2}{9}$ is

(1)$\frac{\sqrt{3}}{2}$ (2)$\frac{1}{3}$ (3)$\frac{1}{3\sqrt{2}}$ (4)$\frac{1}{\sqrt{3}}$

7. If $\vec{a}$ and $\vec{b}$ are unit vectors such that $[\vec{a}, \vec{b}, \vec{a} \times \vec{b}] = \frac{\pi}{4}$, then the angle between $\vec{a}$ and $\vec{b}$ is

(1)$\frac{\pi}{6}$ (2)$\frac{\pi}{4}$ (3)$\frac{\pi}{3}$ (4)$\frac{\pi}{2}$

8. If the direction cosines of a line are $\frac{1}{c}, \frac{1}{c}, \frac{1}{c}$, then

(1)$c = \pm 3$ (2)$c \pm \sqrt{3}$ (3)$c > 0$ (4)$0 < c < 1$

9. The point of inflection of the curve $y = (x-1)^3$ is

(1)(0, 0) (2)(0, 1) (3)(1, 0) (4)(1, 1)

10. The number given by the Mean value theorem for the function $\frac{1}{x}, x \in [1, 9]$ is

(1)2 (2)2.5 (3)3 (4)3.5

11. If $w(x, y) = x^y, x > 0$, then $\frac{\partial w}{\partial x}$ is equal to

(1)$x^y \log x$ (2)$y \log x$ (3)yx^{y-1} (4)$x \log y$

12. The value of $\int_0^1 x(1-x)^{99} dx$ is

(1)$\frac{1}{11000}$ (2)$\frac{1}{10100}$ (3)$\frac{1}{10010}$ (4)$\frac{1}{10001}$

13. If $\frac{\Gamma(n+2)}{\Gamma(n)} = 90$ then n is

(1)10 (2)5 (3)8 (4)9

14. The order of the differential equation of all circles with centre at (h, k) and radius 'a' is

(1)2 (2)3 (3)4 (4)1

15. If $P(X = 0) = 1 - P(X = 1)$. If $E[X] = 3\,Var(X)$, then $P(X = 0)$ is

(1) $\frac{2}{3}$ (2) $\frac{2}{5}$ (3) $\frac{1}{5}$ (4) $\frac{1}{3}$

16. The operation $*$ defined by $a * b = \frac{ab}{7}$ is not a binary operation on

(1) $\mathbb{Q}^+$ (2) $\mathbb{Z}$ (3 $\mathbb{R}$ (4) $\mathbb{C}$

17. A is of order n, $\lambda \neq 0$ then $adj(\lambda A) =$

(1) $\lambda^{n-1} adj(A)$ (2) $\lambda^{n-2} adj(A)$ (3) $\frac{1}{\lambda} adj(A)$ (4) $\lambda^n adj(A)$

18. The amplitude and period of $y = a\tan bx$ are respectively

(1) $|a|, \frac{\pi}{|b|}$ (2) $a, \frac{\pi}{b}$ (3) not defined, $\frac{\pi}{|b|}$ (4) not defined, $\frac{\pi}{b}$

19. Let X be a continuous random variable. The function $f(x)$ is said to be a $p.d.f$ if

(1) $f(x) > 0$ and $\int_a^b f(x)dx = 0$ (2) $f(x) \geq 0$ and $\int_a^b f(x)dx = 1$

(3) $f(x) > 0$ and $\int_a^b f(x)dx = 1$ (4) $f(x) \geq 0$ and $\int_a^b f(x)dx = 0$

20. Which one of the following is correct ?

(1) $[3] +_4 [2] = [5]$ (2) $[0] +_{10} [12] = [0]$ (3) $[4] \times_5 [3] = [12]$ (4) $[5] \times_6 [4] = [2]$

SECTION - B

Note: (i) Answer any 7 questions. **7 x 2 =14**

(ii) Question No: 30 is compulsory:

21. Prove that $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ is orthogonal.

22. Show that $(2 + i\sqrt{3})^{10} + (2 - i\sqrt{3})^{10}$ is real

23. Find the value of $tan^{-1}\left(tan\frac{5\pi}{4}\right)$

24. Obtain the equation of the circle for which (3,4) and $(2, -7)$ are the ends of a diameter.

25. Find the volume of the parallelopiped whose coterminous edges are represented by the vectors $-6\hat{i} + 14\hat{j} + 10\hat{k}$, $14\hat{i} - 10\hat{j} - 6\hat{k}$ and $2\hat{i} + 4\hat{j} - 2\hat{k}$.

26. Evaluate the limit $\lim_{x \to 0}\left(\frac{\sin x}{x^2}\right)$.

27. Assume that the cross section of the artery of human is circular. A drug is given to a patient to dilate his arteries. If the radius of an artery is increased from 2mm to 2.1mm, how much is cross-sectional area increased approximately?

28 Solve $\frac{dy}{dx} + 2y = e^{-x}$.

29 A fair die is tossed 240 times, and X denote the number of times that four appeared. Using binomial distribution find the mean and variance of X.

30 Evaluate : $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} |sinx|dx$.

SECTION – C

Note: (i) Answer any Seven Questions. **7 x 3 = 21**

(ii) Question No.40 is compulsory

31 Find the rank of the matrix $\begin{bmatrix} 2 & -2 & 4 & 3 \\ -3 & 4 & -2 & -1 \\ 6 & 2 & -1 & 7 \end{bmatrix}$ by reducing it to an echelon form.

32 Find the domain of the following $g(x) = 2\,sin^{-1}(2x-1) - \frac{\pi}{4}$.

33 Find the equation of the hyperbola if Foci $(\pm 2,0) and, e = \frac{3}{2}$

34 Find the shortest distance between the given straight lines $\vec{r} = (2\hat{i} + 3\hat{j} + 4\hat{k}) + t(-2\hat{i} + \hat{j} - 2\hat{k})$ and $\frac{x-3}{2} = \frac{y}{-1} = \frac{z+2}{2}$.

35 Find the absolute extrema of the following functions on the given closed interval.

$f(x) = x^2 - 12x + 10$; $[1,7]$

36 Evaluate $\int_b^{\infty} \frac{1}{a^2+x^2} dx, a > 0, b \in \mathbb{R}$.

37 Show that $y = 2(x^2 - 1) + ce^{-x^2}$ is a solution of the differential equation $\frac{dy}{dx} + 2xy - 4x^3 = 0$.

38 Three fair coins are tossed simultaneously. Find the probability mass function for number of heads occurred.

39 Let A be $Q - \{1\}$. Define $*$ on A by $x * y = x + y - xy$. Examine the closure, commutative, associative properties.

40 If $x_n = \cos\frac{\pi}{2^n} + i\sin\frac{\pi}{2^n}$, prove that $x_1 x_2 x_3 \ldots\ldots x_n = -1$

SECTION - D

Answer all questions of the following: **7 x 5 = 35**

41 (a)A family of 3 people went out for dinner in a restaurant. The cost of two dosai, three idlies and two vadais is ₹150. The cost of the two dosai, two idlies and four vadais is ₹200. The cost of five dosai, four idlies and two vadais is ₹250. The family has ₹350 in hand and they ate 3 dosai and six idlies and six vadais. Will they be able to manage to pay the bill within the amount they had?

(or)

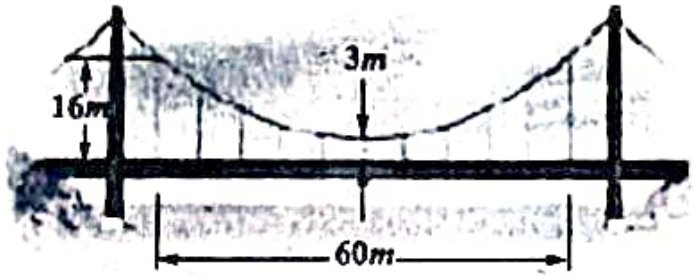
(b) If $w(x,y,z) = log\left(\frac{5x^3y^4+7y^2xz^4-75y^3z^4}{x^2+y^2}\right)$, find $x\frac{\partial w}{\partial x} + y\frac{\partial w}{\partial y} + z\frac{\partial w}{\partial z}$.

42 (a) If z_1, z_2, and z_3 are three complex numbers such tat $|z_1| = 1$, $|z_2| = 2$, $|z_3| = 3$ and $|z_1 + z_2 + z_3| = 1$, show that $|9z_1z_2 + 4z_1z_3 + z_2z_3| = 6$.

(or)

(b) Show that $p \leftrightarrow q \equiv (p \wedge q) \vee (\neg p \wedge \neg q)$.

43. (a) Parabolic cable of 60m portion of the roadbed of a suspension bridge are positioned as shown below. Vertical cables are to be spaced every 6m along this portion of the roadbed. Calculate the lengths of first two of these vertical cables from the vertex.



(or)

(b) Solve the following equation: $x^4 - 10x^3 + 26x^2 - 10x + 1 = 0$.

44. (a) Prove by vector method that $sin(\alpha + \beta) = sin\,\alpha\, cos\,\beta + cos\,\alpha\, sin\,\beta$.

(or)

(b) The probability density function of X is given by $f(x) = \begin{cases} k\,e^{-\frac{x}{3}} & \text{for } x > 0 \\ 0 & \text{for } x \leq 0 \end{cases}$

Find (i) the value of k (ii) the distribution function (iii) $P(5 \leq X)$

45. (a) If the curves $ax^2 + by^2 = 1$ and $cx^2 + dy^2 = 1$ intersect each other orthogonally if $\frac{1}{a} - \frac{1}{b} = \frac{1}{c} - \frac{1}{d}$.

(or)

(b) Prove that $\int_0^{\frac{\pi}{4}} log(1 + tan\,x)dx = \frac{\pi}{8} log\,2$.

46. (a) If $cos^{-1}x + cos^{-1}y + cos^{-1}z = \pi$ and $0 < x, y, z < 1$, then show that $x^2 + y^2 + z^2 + 2xyz = 1$.

(or)

(b) Find the area of the region bounded by the line $y = 2x + 5$ and the parabola $y = x^2 - 2x$.

47. (a) In a murder investigation, a corpse was found by a detective at exactly 8 P.M. Being alert, the detective also measured the body temperature and found it to be 70°F. Two hours later, the detective measured the body temperature again and found it to be 60°F. If the room temperature is 50°F, and assuming that the body temperature of the person before death was 98.6°F, at what time did the murder occur? $[log(2.43) = 0.88789; log(0.5) = -0.69315]$

(or)

(b) Find the image of the point whose position vector is $3\hat{i} - 2\hat{j} + \hat{k}$ in the plane $\vec{r} \cdot (3\hat{i} - \hat{j} + 4\hat{k}) = 2$