Class : 11

Register Number

SECOND REVISION EXAMINATION - 2025

MATHEMATICS

Time Allowed : 3.00 Hours] **[Max. Marks : 90**

INSTRUCTION : 1.Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.

2. Use Blue or Black ink to write and underline and Pencil to draw diagrams.

Part - I

Note (i) Answer All the questions. **20×1=20**

(ii) Choose the most suitable answer from the given four alternatives and write the option code and the corresponding answer.

1. If A $\{(x,y): y = e^x, x \in R\}$ and B = $\{(x,y) : y = e^{-x}, x \in R\}$ then n (A∩B) is

   (a) ∞ (b) 0 (c) 1 (d) 2

2. The number of constant functions from a set containing 'm' elementsto a set containing 'n' elements is :

   (a) mn (b) m (c) n (d) m+n

3. The range of the function $f(x) = |[x] - x|, x \in R$ is :

   (a) [0, 1] (b) [0, ∞) (c) [0, 1) (d) (0, 1)

4. If a and b are the roots of the equation $x^2-kx+16=0$ and satisfy $a^2+b^2=32$ then thevalue of k is :

   (a) 10 (b) -8 (c) -8, 8 (d) 6

5. If $\frac{kx}{(x+2)(x-1)} = \frac{2}{x+2} + \frac{1}{x-1}$ then the value of k is

   (a) 1 (b) 2 (c) 3 (d) 4

6. $\cos1^o+\cos2^o+\cos3^o+\ldots+\cos179^o$ =

   (a) 0 (b) 1 (c) -1 (d) 89

7. If $\sin\alpha + \cos\alpha = b$, then $\sin2\alpha$ is equal to :

   (a) b^2-1, if $b \leq \sqrt{2}$ (b) b^2-1, if $b > \sqrt{2}$

   (c) b^2-1, if $b \geq 1$ (d) b^2-1, if $b \geq \sqrt{2}$

8. The coefficient of x^5 in the series $e^{2x}$is

   a) $\frac{2}{3}$ b) $\frac{3}{2}$ c) $-\frac{4}{15}$ d) $\frac{4}{15}$

9. The length of the perpendicular from the origin to the line $\frac{x}{3} - \frac{y}{4} = 1$ is

   a) $\frac{11}{5}$ b) $\frac{5}{12}$ c) $\frac{12}{5}$ d) $-\frac{5}{12}$

10. If the lines represented by the equation $9x^2-24xy+16y^2=0$ makes angles θ_1 and θ_2 with x-axis, then $\tan\theta_1 \tan\theta_2$ =

    a) $-\frac{9}{16}$ b) $-\frac{16}{9}$ c) $\frac{9}{16}$ d) $\frac{16}{9}$

11. If A is a square matrix, then which of the following is not symmetric :

(a) $A+A^T$ (b) AA^T (c) A^TA (d) $A-A^T$

12. If $\vec{a} = \hat{i} + 2\hat{j} + 2\hat{k}$, $|\vec{b}| = 5$ and the angle between $\vec{a}$ and $\vec{b}$ is $\frac{\pi}{6}$ then the area of the triangle formed by these two vectors as two sides is :

a) $\frac{7}{4}$ b) $\frac{15}{4}$ c) $\frac{3}{4}$ d) $\frac{17}{4}$

13. The vectors $\hat{i} - \hat{j}, \hat{j} - \hat{k}, \hat{k} - \hat{i}$ are :

(a) parallel to each other (b) unit vectors

(c) mutually perpendicular vectors (d) coplanar vectors

14. $\lim_{x \to 0} \frac{\sqrt{1 - \cos 2x}}{x}$

(a) 0 (b) 1 (c) $\sqrt{2}$ (d) does not exists

15. $\lim_{n \to \infty} \left(\frac{1}{n^2} + \frac{2}{n^2} + \frac{3}{n^2} + \ldots\ldots + \frac{n}{n^2} \right)$ is

a) $\frac{1}{2}$ b) 0 c) 1 d) ∞

16. $\frac{d}{dx}(3^x + x^3) =$

a) $3x^3 + (\log 3)3^x$ b) $x^3 + \log 3$ c) $(\log^3)(3^x) + 3x^2$ d) $3^{x-1}\, x + (\log 3)3^x$

17. The number of points in R in which the function $f(x)=|x-1|+|x-3|+\sin x$ is not differentiable is :

(a) 3 (b) 2 (c) 1 (d) 4

18. The differentiate of $y = |x-1|$ at $x=1$ is :

(a) 1 (b) -1 (c) 0 (d) does not exist

19. $f(x) = x \tan^{-1} x$ then find $f'(1)$:

a) $\frac{1}{2} - \frac{\pi}{4}$ b) $\frac{1}{2} + \frac{\pi}{4}$ c) $\frac{\pi}{4}$ d) $\frac{1}{2}$

20. Find $\lim_{x \to 0} \frac{\sin 2x}{x}$

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

PART – II

Note (i) Answer any Seven questions. **7X2= 14**

(ii) Question No.30 is compulsory.

21. If $f : [-2,2] \to B$ is given by $f(x) = 2x^3$, then find B so that f is onto.

22. Write the values of f at -3 and 0 if : $f(x) = \begin{cases} x^2 + x - 5 & \text{if } x \in (-\infty, 0) \\ x^2 + 3x - 2 & \text{if } x \in (3, \infty) \\ x^2 & \text{if } x \in (0, 2) \\ x^2 - 3 & \text{otherwise} \end{cases}$

23. Find the expansion of $\frac{1}{(2+x)^4}$ where $|x| < 2$ upto the fourth term.

24. Find the combined equation of the straight lines whose separate equations are x-2y=0 and 2x+y=0. What can you say about the two lines ?

25. Find b if the matrix $\begin{bmatrix} b-1 & 2 & 3 \\ 3 & 1 & 2 \\ 1 & -2 & 4 \end{bmatrix}$ is singular

26. Find the sum A - B + C if $A = \begin{bmatrix} \sec^2\theta & \sin^2\theta \\ \cot^2\theta & 0 \end{bmatrix}$ $B = \begin{bmatrix} \tan^2\theta & -\cos^2\theta \\ \operatorname{cosec}^2\theta & -1 \end{bmatrix}$ $C = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$

27. Find the derivative of $\sin^{-1}(3x-4x^3)$.

28. Show that $\lim_{x \to \infty} \left(\frac{x+2}{x-2}\right)^x = e^4$

29. Show that $f(x) = \sqrt{1-x^2}$ is continuous on [-1, 1].

30. Find f' (2) and f' (4) if f(x) = |x-3|

PART – III

Note (i) Answer any seven questions. **7X3= 21**

(ii) Question No.40 is compulsory and choose any nine from the remaining

31. If f : R → R is defined as $f(x)=2x^2-1$, find the pre-images of 17, 4 and -2.

32. Find the domain of $= \frac{1}{1-2\sin x}$

33. If ${}^nP_r = 720$ and ${}^nC_r = 120$ find n, r

34. If $a_1, a_2, a_3, \ldots, a_n$ is an arithmetic progression, prove that every term a_k $(k > 1)$ is the arithmetic mean of its immediate predecessor a_{k-1} and immediate successor a_{k+1}

35. The length of the perpendicular drawn from the origin to the line is 12 and makes an angle 150° with the positive direction of the x-axis. Find the equation of the line

36. Find the vectors of magnitude $10\sqrt{3}$ that are perpendicular to the plane which contains $\hat{i} + 2\hat{j} + \hat{k}$ and $\hat{i} + 3\hat{j} + 4\hat{k}$.

37. Does the limit for the function $\frac{\sin|x|}{x}$ exists when $x \to 0$. State reasons for your answer.

38. If $y = \sin^4 x + \cos^4 x$ find $\frac{dy}{dx}$

39. In the set Z of integers, define mRn if m-n is a multiple of 12. Prove that R is an equivalence relation.

40. Solve $\sqrt{3}\sin x+\cos x=2$

PART – IV

Note (i) Answer All the questions. **7X5= 35**

41. (a) Let $f, g : R \to R$ is defined as $f(x) = 2x- |x|$ and $g(x) = 2x + |x|$ find fog. **(Or)**

(b) Solve : $\dfrac{x^2 - 4}{x^2 - 2x - 15} \leq 0$

42. (a) If $A + B + C = \dfrac{\pi}{2}$ prove that $\sin2A+\sin2B+\sin2C=4\cos A \cos B \cos C$ **(Or)**

(b) In a Δ ABC, prove that $\sin\left(\dfrac{B - C}{2}\right) = \dfrac{b - c}{a} \cos \dfrac{A}{2}$

43. (a) By the principle of mathematical induction, prove that , for $n \geq 1$.

$$1^3+ 2^3+3^3 + \ldots+n^3 = \left(\frac{n(n+1)}{2}\right)^2$$ **(Or)**

(b) Show that the equation $4x^2+4xy+y^2-6x-3y-4=0$ represents a pair of parallel lines. Find the distance between them.

44. (a) Show that $\begin{vmatrix} b+c & a & a^2 \\ c+a & b & b^2 \\ a+b & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)(a+b+c)$. **(Or)**

(b) Prove using vectors that the medians of a triangle are concurrent

45. (a) Show that the function $\begin{cases} \dfrac{x^3 - 1}{x - 1} & \text{if } x \neq 1 \\ 3 & \text{if } x = 1 \end{cases}$ is continuous on $(-\infty,\infty)$. **(Or)**

(b) If $y = e^{\tan^{-1}x}$ show that $(1+x^2)y'' + (2x-1)y' = 0$.

46. (a) Prove that $\sqrt{x^2 + 25} - \sqrt{x^2 + 9} = \dfrac{8}{x}$ nearly when x is large. **(Or)**

(b) Evaluate : $\lim\limits_{x \to 0} \dfrac{\sqrt{1 + x^2} - x}{x}$

47. (a) Find the cosine and sine angle between the vectors $\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}$ and $\vec{b} = 4\hat{i} - 2\hat{j} + 2\hat{k}$

(Or)

(b) Differentiate $\sin(ax^2+bx+c)$ with respect to $\cos(lx^2+mx+n)$