Class : 11

Register Number | | | | | | | |

FIRST REVISION EXAMINATION, JANUARY - 2025

MATHEMATICS

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

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. The numbers of relations on a set containing 3 elements is

   1) 1024 2) 9 3) 512 4) 81

2. If the function $f : [-3, 3] \to S$ defined by $f(x) = x^2$ is onto, then S is

   1) $[-9, 9]$ 2) R 3) $[-3, 3]$ 4) $[0, 9]$

3. Given that x,y and b are real numbers $x < y$, $n > 0$, then

   1) $xb < yb$ 2) $xb \leq yb$ 3) $xb > yb$ 4) $\frac{x}{b} \geq \frac{y}{b}$

4. The equation whose roots are numerically equal but opposite in sign to the roots $3x^2 - 5x - 7 = 0$

   1) $3x^2 + 5x - 7 = 0$ 2) $3x^2 + x - 7$ 3) $3x^2 - 5x + 7 = 0$ 4) $3x^2 - 5x - 7 = 0$

5. $\cos 1^\circ + \cos 2^\circ + \cos 3^\circ + \ldots\ldots + \cos 179^\circ =$

   1) 89 2) 0 3) 1 4) -1

6. The number of five digit telephone numbers having at least one of their digits repeated is

   1) 30240 2) 90000 3) 69760 4) 10000

7. ${}^{(a-1)}C_r + {}^{(n-1)}C_{(r-1)}$ என்பது

   1) ${}^{(n-1)}C_r$ 2) ${}^{(n+1)}C_r$ 3) ${}^{n}C_{r-1}$ 4) ${}^{n}C_r$

8. The HM of two positive numbers whose AM and GM are 16,8 respectively is

   1) 4 2) 10 3) 5 4) 6

9. The slope of the line which makes an angle 45° with the line $3x - y = -5$ are

   1) $2, \frac{-1}{2}$ 2) $1, \frac{1}{2}$ 3) $\frac{1}{2}, -2$ 4) $1, -1$

10. If one of the lines given by $6x^2 - xy + 4cy^2 = 0$ is $3x + 4y = 0$, then C equals to

    a) 3 2) -3 3) 1 4) -1

11. If $A = \begin{bmatrix} \lambda & 1 \\ -1 & -\lambda \end{bmatrix}$, then for what value of λ, $A^2 = 0$?

    a) 1 2) 0 3) ± 1 4) -1

12. If the points (x-2), (5,2), (8,8) are collinear, then x is equal to

    a) 3 2) $1/3$ 3) 1 4) -3

13. If $\vec{a} + 2\vec{b}$ and $3\vec{a} + m\vec{b}$ are parallel, then the value of m is

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

14. If $|\vec{a}| = 13$, $|\vec{b}| = 5$ and $\vec{a}.\vec{b} = 60^\circ$ then, $|\vec{a} \times \vec{b}|$ is

1) 15 2) 25 3) 35 4) 45

15. The value of $\lim_{x \to 0} \frac{\sin x}{\sqrt{x^2}}$ is

1) -1 2) 1 3) 0 4) limit does not exist

16. If $f(x) = x\tan^{-1}x$, then $f'(1)$ is

1) 2 2) $\frac{1}{2} - \frac{\pi}{4}$ 3) $\frac{1}{2} + \frac{\pi}{4}$ 4) $1 + \frac{\pi}{4}$

17. The derivative of $f(x) = |x|$ at $X = -3$ is

1) 0 2) 6 3) -6 4) does not exist

18. $\int \sqrt{\frac{1-x}{1+x}}\, dx$ is

1) $\sin^{-1} x - \sqrt{1-x^2} + c$ 2) $\sqrt{1-x^2} + \sin^{-1} x + c$

3) $\sqrt{1-x^2} + \log|x + \sqrt{1-x^2}| + c$ 4) $\log|x + \sqrt{1-x^2}| - \sqrt{1-x^2} + c$

19. If A and B are any two events, then the probability that exactly one of them occur is

1) $P(A \cap \overline{B}) + P(\overline{A} \cap B)$ 2) $P(A \cup \overline{B}) + P(\overline{A} \cup B)$

3) $P(A) + P(B) + 2P(A \cap B)$ 4) $P(A) + P(B) - P(A \cap B)$

20. If two events A and B are independent such that $P(A) = 0.35$ and $P(A \cup B) = 0.6$, then $P(B)$ is

1) $\frac{1}{13}$ 2) $\frac{4}{13}$ 3) $\frac{5}{13}$ 4) $\frac{7}{13}$

PART- II

II. Answer any 7 of the following questions. Question no: 30 is compulsory: **7x2=14**

21. If $n(P(A)) = 1024$, $n(A \cup B) = 15$ and $n(P(B)) = 32$, then find $n(A \cap B)$.

22. Find the value of (i) cos 135° (ii) tan 120°

23. If $\frac{1}{7!} + \frac{1}{8!} = \frac{A}{9!}$ then find the value of A.

24. If t_k is the k^{th} term of a GP, then show that t_{n-k}, t_n, t_{n+k} also form a GP for any positive integer k.

25. Find the family of straight lines (i) Perpendicular (ii) Parallel to $3x + 4y - 12 = 0$.

26. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ x & 2 & y \end{bmatrix}$ is a matrix such that $AA^T = 9I$, find the values of x and y

27. If G is the centroid of a triangle ABC, prove that $\vec{GA} + \vec{GB} + \vec{GC} = 0$.

28. Evaluate: $\lim_{x \to 2} \frac{x^4 - 16}{x - 2}$

29. Differentiate : $y = e^{\sin x}$

30. Integrate: $\frac{\cos x}{\sin^2 x}$

PART- III

III. Answer any 7 questions of the following. Question no: 40 is compulsory. **7x3=21**

31. Graph the functions $f(x) = x^3$ and $g(x) \sqrt[3]{x}$ on the same co ordinate plane. Find fog and graph it on the plane as well. Explain your results.

32. If the logarithm of 324 to base a is 4, then find a.

33. Prove that $\sin 4A = 4\sin A \cos^3 A - 4 \cos A \sin^3 A$

34. Find the sum of all 4 - digit numbers that can be formed using digits 1,2,3,4 and 5 repetitions not allowed?

35. If the points P(6, 2) and Q (-2, 1) and R are the vertices of a ΔPQR and R is the point on the locus y = x2 - 3x + 4, then find the equation of the locus of centroid of ΔPQR.

36. If A_i, B_i, C_i are the co factors of a_i, b_i, c_i respectively. i = 1 to 3 in $|A| = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$ show that $\begin{vmatrix} A_1 & B_1 & C_1 \\ A_2 & B_2 & C_2 \\ A_3 & B_3 & C_3 \end{vmatrix} = |A|^2$

37. Find the vectors of magnitude 6 which are perpendicular to both vectors $\vec{a} = 4\hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = -2\hat{i} + \hat{j} - 2\hat{k}$.

38. Differentiate : $y = (x^2 + 5) \log (1+x)^{e-3x}$

39. Given that P(A) = 0.6 P(B) = 0.5 P(A∩B) = 0.2 Find (i) P(A/B) (ii) P(A/B) (iii) P(A/B)

40. Integrate : $x^2 e^{5x}$

PART - IV

IV. Answer all questions of the following: **7x5=35**

41. (a) If f:R → R is defined by f(x) = 2x- 3 prove that f is a bijection and find its inverse.

(OR)

(b) Find the value of $\sqrt[3]{65}$

42. (a) Simplify : $\frac{1}{3-\sqrt{8}} - \frac{1}{\sqrt{8}-\sqrt{7}} + \frac{1}{\sqrt{7}-\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{5}} + \frac{1}{\sqrt{5}-2}$

(OR)

(b) A factory has two Machines-I and II. Machine-I produces 60% of items and Machine-II produces 40% of the items of the total output. Further 2% of the items produced by Machine-I are defective where as 4% produced by Machine II are defective. If an item is drawn at random what is the probability that it is defective?

43. (a) If $\theta + \phi = \alpha$ and $\tan\theta = k \tan\phi$, then prove that $\sin(\theta - \phi) = \frac{k-1}{k+1}\sin\alpha$

(OR)

(b) By the principle of mathematical induction , prove that , for $n > 1$

$1^2 + 3^2 + 5^2 + \ldots\ldots\ldots + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{3}$

44. (a) The sum of the distance of a moving point from the points (4, 0) and (-4, 0) is always 10 units. Find the equation of the locus of the moving point.

(OR)

(b) If $y = \frac{\sin^{-1}x}{\sqrt{1-x^2}}$ show that $(1-x^2)y_2 - 3xy_1 - y = 0$

45. (a) The slope of one of the straight lines $ax^2 + 2hxy + by^2 = 0$ is twice that of the other, show that $8h^2 = 9ab$.

(OR)

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

46. (a) Evaluate the integrals : $\int \frac{5x-7}{\sqrt{3x-x^2-2}}\,dx$

(OR)

(b) Without expanding the determinants,show that $|B| = 2|A|$. Where

$$B = \begin{bmatrix} b+c & c+a & a+b \\ c+a & a+b & b+c \\ a+b & b+c & c+a \end{bmatrix} \text{ and } A = \begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix}$$

47. (a) Prove that $\begin{bmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{bmatrix} = abc\left(1 + \frac{1}{a} + \frac{1}{b} + \frac{1}{c}\right)$

(OR)

(b) For any vector $\vec{a}$ prove that $|\vec{a} \times \hat{i}|^2 + |\vec{a} \times \hat{j}|^2 + |\vec{a} \times \hat{k}|^2 = 2|\vec{a}|^2$