Register No.

11

Second Revision Examination - 2025
MATHEMATICS

Time : 3.00 Hrs. Marks : 90

PART - A

20 x 1 = 20

I. **Choose the best answer**

1. The rule $f(x) = x^2$ is a bijection if the domain and the co-domain are given by
   a) R, R b) R, $(0, \infty)$ c) $(0, \infty)$, R d) $[0, \infty)$, $[0, \infty)$
2. Let $f : R \to R$ be defined by $f(x) = 1 - |x|$. Then the range of f is a) R b) $(1, \infty)$ c) $(-1, \infty)$ d) $(-\infty, 1)$
3. If $\log_{\sqrt{x}} 0.25 = 4$ then the value of x is a) 0.5 b) 2.5 c) 1.5 d) 1.25
4. The equation whose roots are numerically equal but opposite in sign to the roots of $3x^2 - 5x - 7 = 0$ is
   a) $3x^2 - 5x - 7 = 0$ b) $3x^2 + 5x - 7 = 0$ c) $3x^2 - 5x + 7 = 0$ d) $3x^2 + x - 7$
5. If $\cos 28^0 + \sin 28^0 = k^3$, then $\cos 17^0$ is equal to a) $\frac{k^3}{\sqrt{2}}$ b) $-\frac{k^3}{\sqrt{2}}$ c) $\pm\frac{k^3}{\sqrt{2}}$ d) $-\frac{k^3}{\sqrt{3}}$
6. If $\tan\alpha$ and $\tan\beta$ are the roots of $x^2 + ax + b = 0$, then $\frac{\sin(\alpha+\beta)}{\sin\alpha\sin\beta}$ is equal to a) $\frac{b}{a}$ b) $\frac{a}{b}$ c) $-\frac{a}{b}$ d) $-\frac{b}{a}$
7. The number of 5 digit numbers all digits of which are ood is a) 25 b) 5^5 c) 5^6 d) 625
8. If ${}^nC_4$, ${}^nC_5$, ${}^nC_6$ are in AP the value of n can be a) 14 b) 11 c) 9 d) 5
9. The sum upto n terms of the series $\sqrt{2}+\sqrt{8}+\sqrt{18}+\sqrt{32}+\ldots$ ... is a) $\frac{n(n+1)}{2}$ b) $2n(n+1)$ c) $\frac{n(n+1)}{\sqrt{2}}$ d) 1
10. The value of $\frac{1}{2!}+\frac{1}{4!}+\frac{1}{6!}+\ldots$ is...........a) $\frac{e^2+1}{2e}$ b) $\frac{(e+1)^2}{2e}$ c) $\frac{(e-1)^2}{2e}$ d) $\frac{e^2-1}{2e}$
11. Straight line joining the points (2, 3) and (–1, 4) passes through the point (α, β) if
    a) $\alpha + 2\beta = 7$ b) $3\alpha + \beta = 9$ c) $\alpha + 3\beta = 11$ d) $3\alpha + \beta = 11$
12. The image of the point (2, 3) in the line $y = -x$ is a) (–3, –2) b) (–3, 2) c) (–2, –3) d) (3, 2)
13. If the points (x, –2), (5, 2), (8, 8) are collinear, then x is equal to a) –3 b) $\frac{1}{3}$ c) 1 d) 3
14. The unit vector parallel to the resultant of the vectors $\hat{i}+\hat{j}-\hat{k}$ and $\hat{i}-2\hat{j}+\hat{k}$ is
    a) $\frac{\hat{i}-\hat{j}+\hat{k}}{\sqrt{5}}$ b) $\frac{2\hat{i}+\hat{j}}{\sqrt{5}}$ c) $\frac{2\hat{i}-\hat{j}+\hat{k}}{\sqrt{5}}$ d) $\frac{2\hat{i}-\hat{j}}{\sqrt{5}}$
15. If $\lambda\hat{i}+2\lambda\hat{j}+2\lambda\hat{k}$ is a unit vector, then the value of λ is a) $\frac{1}{3}$ b) $\frac{1}{4}$ c) $\frac{1}{9}$ d) $\frac{1}{2}$
16. $\lim_{x\to\infty}\frac{\sqrt{x^2-1}}{2x+1}$ = a) 1 b) 0 c) –1 d) $\frac{1}{2}$
17. If $pv = 81$, then $\frac{dp}{dv}$ at $v = 9$ is a) 1 b) –1 c) 2 d) –2
18. $\int \tan^{-1}\sqrt{\frac{1-\cos 2x}{1+\cos 2x}}\,dx$ a) $x^2 + c$ b) $2x^2 + c$ c) $\frac{x^2}{2}+c$ d) $-\frac{x^2}{2}+c$
19. A number is selected from the set {1, 2, 3, ... 20}. The probability that the selected number is divisible by 3 or 4 is
    a) $\frac{2}{5}$ b) $\frac{1}{8}$ c) $\frac{1}{2}$ d) $\frac{2}{3}$
20. It is given that the events A and B are such that $P(A) = \frac{1}{4}$, $P(A/B) = \frac{1}{2}$ and $P(B/A) = \frac{2}{3}$. Then P(B) is
    a) $\frac{1}{6}$ b) $\frac{1}{3}$ c) $\frac{2}{3}$ d) $\frac{1}{2}$

PART - B

II. **(i) Answer any seven questions. (ii) Question No.30 is compulsory.** **7 x 2 = 14**

21. Solve $|3 - x| < 7$
22. Find the values of $\sin(-1110^0)$
23. Find the number of ways of arranging the letters of the word BANANA.
24. Find the equation of the straight line parallel to $5x - 4y + 3 = 0$ and having x-intercept 3.
25. Construct an m x n matrix $A = [a_{ij}]$, where a_{ij} is given by $a_{ij} = \frac{(i-2j)^2}{2}$ with m = 2, n = 3.

26. If $\vec{PO}+\vec{OQ}=\vec{QO}+\vec{OR}$, prove that the points P, Q, R are collinear.

27. Calculate $\lim_{x \to 3} \frac{(x^2-6x+5)}{x^3-8x+7}$

28. Find the derivative $y = e^x \sin x$.

29. Integrate $\cos(5-11x)$

30. If two coins are tossed simultaneously, then find the probability of getting one head and one tail.

PART - C

(i) Answer any seven questions. (ii) Question No.40 is compulsory. **7 x 3 = 21**

31. Find the range of the function $\frac{1}{\cos x - 1}$

32. If $\log_2 x + \log_4 x + \log_{16} x = \frac{7}{2}$, find the value of x.

33. A Kabaddi coach has 14 players ready to play. How many different teams of 7 players could the coach put on the court?

34. Show that $4x^2 + 4xy + y^2 - 6x - 3y - 4 = 0$ represents a pair of parallel lines.

35. Find the value of λ for which the vectors $\vec{a} = 3\hat{i}+2\hat{j}+9\hat{k}$ and $\vec{b} = \hat{i}+\lambda\hat{j}+3\hat{k}$ are parallel.

36. Differentiate $y = x^{\sqrt{x}}$

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37. If $\lambda = -2$, determine the value of $\begin{vmatrix} 0 & 2\lambda & 1 \\ \lambda^2 & 0 & 3\lambda^2+1 \\ -1 & 6\lambda-1 & 0 \end{vmatrix}$

38. Evaluate : $\lim_{x \to 0} \frac{2^x - 3^x}{x}$

39. If $f1(x) = 9x^2 - 6x$ and $f(0) = -3$, find f(x).

40. A bag contains 7 red and 4 black balls, 3 balls are drawn at random. Find the probability that (i) all are red (ii) one red and 2 black.

PART - D

Answer all the questions. **7 x 5 = 35**

41. a) Write the values of f at –4, 1, –2, 7, 0 if $f(x) = \begin{cases} -x+4 & \text{if } -\infty < x \le -3 \\ x+4 & \text{if } -3 < x < -2 \\ x^2-x & \text{if } -2 \le x < 1 \\ x-x^2 & \text{if } 1 \le x < 7 \\ 0 & \text{otherwise} \end{cases}$ **(OR)**

b) Evaluate : $\lim_{x \to 0} \frac{\sqrt{1+\sin x} - \sqrt{1-\sin x}}{\tan x}$

42. a) 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 wheras 4% produced by Machine-II are defective. If an item is drawn at random what is the probability that it is defective? **(OR)**

b) Show that the equation $2x^2 - xy - 3y^2 - 6x + 19y - 20 = 0$ represents a pair of intersecting lines. Show further that the angle between them is $\tan^{-1}(5)$.

43. a) Using the Mathematical induction, prove that $3^{2n+2} - 8n - 9$ is divisible by 8 for all $n \ge 1$. **(OR)**

b) If $A + B + C = \pi$, prove that $\cos^2 A + \cos^2 B + \cos^2 C = 1 - 2\cos A \cos B \cos C$.

44. a) Integrate $\frac{3x+1}{2x^2-2x+3}$ **(OR)** b) Prove that $\sqrt[3]{x^3+6} - \sqrt[3]{x^3+3}$ is approximately equal to when x is sufficiently large.

45. a) Find the derivative of $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ with respect to tan–1x. **(OR)**

b) Show that the points whose position vectors $2\hat{i}+4\hat{j}+3\hat{k}$, $4\hat{i}+\hat{j}+9\hat{k}$ and $10\hat{i}-\hat{j}+6\hat{k}$ form a right angled triangle.

46. a) An exam paper contains 8 questions, 4 in Part A and 4 in Part B. Examiners are required to answer 5 questions. In how many ways can this be done if (i) There are no restrictions of choosing a number of questions in either parts. (ii) At least two questions from Part A must be answered. **(OR)**

b) Express the matrix $A = \begin{bmatrix} 1 & 3 & 5 \\ -6 & 8 & 3 \\ -4 & 6 & 5 \end{bmatrix}$ as the sum of a symmetric and a skew-symmetric matrices.

47. a) Resolve into partial fractions : $\frac{x^3+2x+1}{x^2+5x+6}$ **(OR)** b) If $y = \tan^{-1}\left(\frac{1+x}{1-x}\right)$, find y'.