FIRST REVISION TEST - 2025

Standard XI

Reg.No

MATHEMATICS

Time : 3.00 hrs | Part – I | Marks : 90

I. Choose the correct answer: $20 \times 1 = 20$

1. The function $f : R \to R$ is defined by $f(x) = \sin x + \cos x$ is
   a) An odd function b) Neither an odd function nor an even function
   c) An even function d) Both odd function and even function
2. If $A = \{(x, y) : y = e^x, x \in R\}$ and $B = \{(x, y) : y = e^{-x}, x \in R\}$, then $n(A \cap B)$ is
   a) infinity b) 0 c) 1 d) 2
3. 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
4. $\cos 1^\circ + \cos 2^\circ + \cos 3^\circ + \ldots\ldots + \cos 170^\circ =$
   a) 0 b) 1 c) –1 d) 89
5. The maximum value of $4\sin^2 x + 3\cos^2 x + \sin\frac{x}{2} + \cos\frac{x}{2}$ is
   a) $4 + \sqrt{2}$ b) $3 + \sqrt{2}$ c) 0 d) 4
6. Everybody in a room shakes hands with everybody else. The total number of shake hands is 66. The number of persons in the room is _____.
   a) 11 b) 12 c) 10 d) 6
7. In 3 fingers, the number of ways four rings can be worn is _____ ways.
   a) $4^3 - 1$ b) 3^4 c) 68 d) 64 !
8. The sequence $\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}+\sqrt{2}}, \frac{1}{\sqrt{3}+2\sqrt{2}}$ ..... form and
   a) AP b) GP c) HP d) AGP
9. The sum upto n terms of the series $\sqrt{2} + \sqrt{8} + \sqrt{18} + \sqrt{32}$ ..... is
   a) $\frac{n(n+1)}{2}$ b) $2n(n+1)$ c) $\frac{n(n+1)}{\sqrt{2}}$ d) 1
10. If a vertex of a square is at the origin and its one side lies along the line $4x + 3y - 20 = 0$ then the area of the square is
    a) 20 sq.units b) 16 sq.units c) 25 sq.units d) 4 sq.units
11. Equation of the straight line that forms an isosceles triangle with coordinate axes in the I-quadrant with perimeter $4 + 2\sqrt{2}$ is
    a) $x + y + 2 = 0$ b) $x + y - 2 = 0$ c) $x + y - \sqrt{2} = 0$ d) $x + y + \sqrt{2} = 0$
12. If A and B are symmetric matrices of order n, where $(A \neq B)$, then
    a) A + B is skew-symmetric b) A + B is symmetric
    c) A + B is a diagonal matrix d) A + B is a zero matrix
13. A vector makes equal angle with the positive direction of the coordinate axes. Then each angle is equal to
    a) $\cos^{-1}\left(\frac{1}{3}\right)$ b) $\cos^{-1}\left(\frac{2}{3}\right)$ c) $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$ d) $\cos^{-1}\left(\frac{2}{\sqrt{3}}\right)$

14. If $\vec{r} = \frac{9\vec{a}+7\vec{b}}{16}$, then the point P whose position vector $\vec{r}$ divides the line joining the points with position Vector $\vec{a}$ and $\vec{b}$ in the ratio

a) 7 : 9 internally b) 9 : 7 internally c) 9 : 7 externally d) 7 : 9 externally

15. $\lim_{x\to 0} \frac{e^{\sin x}-1}{x} =$

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

16. $\lim_{x\to \infty} \frac{\sqrt{x^2-1}}{2x+1} =$

a) 1 b) 0 c) –1 d) $\frac{1}{2}$

17. If $y = \cos(\sin x^2)$, then $\frac{dy}{dx}$ at $x = \sqrt{\frac{\pi}{2}}$ is

a) –2 b) 2 c) $-2\sqrt{\frac{\pi}{2}}$ d) 0

18. $\int \sin\sqrt{x}\, dx$ is

a) $2\left(-\sqrt{x}\cos\sqrt{x} + \sin\sqrt{x}\right) + c$ b) $2\left(-\sqrt{x}\cos\sqrt{x} - \sin\sqrt{x}\right) + c$

c) $2\left(-\sqrt{x}\sin\sqrt{x} - \cos\sqrt{x}\right) + c$ d) $2\left(-\sqrt{x}\sin\sqrt{x} + \cos\sqrt{x}\right) + c$

19. A letter is taken at random from the letters of word 'ASSISTANT' and another letter is taken at random from the letters of the word 'STATISTICS'. The probability that the selected letters are the same is

a) $\frac{7}{45}$ b) $\frac{17}{90}$ c) $\frac{29}{90}$ d) $\frac{19}{90}$

20. If m is a number such that $m \le 5$, then the probability that quadratic equation $2x^2 + 2mx + m + 1 = 0$ has real roots is

a) $\frac{1}{5}$ b) $\frac{2}{5}$ c) $\frac{3}{5}$ d) $\frac{4}{5}$

Part - II

II. Answer any 7 questions. (Q.No.30 is compulsory) **7 x 2 = 14**

21. Find the range of the function $f(x) = \frac{1}{1-3\cos x}$

22. Find a positive number smaller than $\frac{1}{2^{1000}}$. Justify.

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

24. Find the constant term of $\left(2x^3 - \frac{1}{3x^2}\right)^5$

25. If $A=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ a & b & -1\end{bmatrix}$, show that A^2 is a unit matrix.

26. For any vector $\vec{r}$, prove that $\vec{r}=(\vec{r}.\hat{i})\hat{i}+(\vec{r}.\hat{j})\hat{j}+(\vec{r}.\hat{k})\hat{k}$

27. Find $\frac{dy}{dx}$, if $x^2+y^2=1$

28. Evaluate : $\int\frac{1}{\sqrt{x+1}+\sqrt{x}}dx$

29. If A and B are two independent events such that P(A) = 0.4 and P(A∪B) = 0.9, find P(B)

30. Prove that $\frac{\sin55^o-\cos55^o}{\sin10^o}=\sqrt{2}$

Part - III

III. Answer any 7 questions. (Q.No.40 is compulsory) **7 x 3 = 21**

31. If f, g : R → R are defined by f(x) = |x| + x and g(x) = |x| – x, find gof and fog.

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

33. Prove that : $\frac{\cot(180^o+\theta)\sin(90^o-\theta)\cos(-\theta)}{\sin(270^o+\theta)\tan(-\theta)\operatorname{cosec}(360^o+\theta)}=\cos^2\theta\cot\theta$

34. If the letters of the word IITJEE are permuted in all possible ways and the strings thus formed are arranged in the lexicographic order, find the rank of the word IITJEE.

35. If exists, find the straight lines by separating the equations $2x^2+2xy+y^2=0$

36. Determine the matrices A and B if they satisfy $2A-B+\begin{bmatrix}6 & -6 & 0\\ -4 & 2 & 1\end{bmatrix}=0$ and $A-2B=\begin{bmatrix}3 & 2 & 8\\ -2 & 1 & -7\end{bmatrix}$

37. If $\vec{a}, \vec{b}$ are unit vectors and θ is the angle between them, show that $\tan\frac{\theta}{2}=\frac{|\vec{a}-\vec{b}|}{|\vec{a}+\vec{b}|}$

38. Evaluate the following limits : $\lim_{x\to a}\frac{\sqrt{x-b}-\sqrt{a-b}}{x^2-a^2}\ (a>b)$

39. An integer is chosen at random from the first ten positive integers. Find the probability that it is (i) an even number (ii) multiple of three

40. In a mathematics paper, there are three sections containing 4, 5 and 6 question respectively. From each section 3 question are to be answered. In how many ways, can the section of questions be made?

Part - IV

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

41. a) From the curve y = sin x, graph the functions (i) y = sin(–x) (ii) y = -sin(–x)

(iii) $y=\sin\left(\frac{\pi}{2}+x\right)$ (iv) $y=\sin\left(\frac{\pi}{2}-x\right)$ Which is also cos x (refer trigonometry)

(OR)

b) Prove that $A = \begin{vmatrix} (q+r)^2 & p^2 & p^2 \\ q^2 & (r+p)^2 & q^2 \\ r^2 & r^2 & (p+q)^2 \end{vmatrix} = 2pqr(p+q+r)^3$

42. a) Solve : $\frac{x^2-4}{x^2-2x-15} \leq 0$ *(OR)*

b) A function f is defined as follows :

$$f(x) = \begin{cases} 0, & \text{for } x < 0 \\ x, & \text{for } 0 \leq x < 1 \\ -x^2+4x-2 & \text{for } 1 \leq x < 3 \\ 4-x & \text{for } x \geq 3 \end{cases}$$

Is the function continuous ?

43. a) If $x = \sum_{n=0}^{\infty} \cos^{2n}\theta$, $y = \sum_{n=0}^{\infty} \sin^{2n}\theta$ and $z = \sum_{n=0}^{\infty} \cos^{2n}\theta \sin^{2n}\theta$, $0 < \theta < \frac{\pi}{2}$, then show that $xyz = x + y + z$ *(OR)*

b) Using the Mathematical induction, show that for any natural number $n \geq 2$

$$\frac{1}{1+2} + \frac{1}{1+2+3} + \frac{1}{1+2+3+4} + \ldots\ldots\ldots + \frac{1}{1+2+3+\ldots\ldots+n} = \frac{n-1}{n+1}$$

44. a) Prove that $\sqrt{\frac{1-x}{1+x}}$ is approximately equal to $1 - x + \frac{x^2}{2}$ when x is very small. *(OR)*

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

45. a) Consider a hollow cylindrical vessel with circumference 24 cm and height 10 cm. An ant is located on the outside of vessel 4 cm from the bottom. There is a drop of honey at the diagrammatically opposite inside of the Vessel, 3 cm from the top (i) What is the shortest distance the ant would need to crawl to get the honey drop? (ii) Equation of the path traced out by the ant. (iii) where the ant enter in to the cylinder? Here is a picture that illustrates the position of the ant and the honey.

(OR)

b) Show that the points whose position vectors $4\hat{i} + 5\hat{j} + \hat{k}$, $-\hat{j} - \hat{k}$, $3\hat{i} + 9\hat{j} + 4\hat{k}$ and $-4\hat{i} + 4\hat{j} + 4\hat{k}$ are coplanar.

46. a) Evaluate the following integrals : $\int \frac{3x+5}{x^2+4x+7} dx$ *(OR)*

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

47. a) The chances of A, B and C becoming manager of a certain company are 5 : 3 : 2. The probabilities that the office canteen will by improved if A, B and C become managers are 0.4, 0.5 and 0.3 respectively. If the office canteen has been improved, what is the probability that B was appointed as the manager? *(OR)*

b) Three vectors $\vec{a}, \vec{b}$ and $\vec{c}$ are such that, $|\vec{a}| = 2, |\vec{b}| = 3, |\vec{c}| = 4$ and $\vec{a} + \vec{b} + \vec{c} = \vec{0}$.

Find $4\vec{a}.\vec{b} + 3\vec{b}.\vec{c} + 3\vec{c}.\vec{a}$

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