XI - Public Model Question - Mathematics - 24

Marks : 90

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I. Answer all questions:- 20 x 1 = 20

① 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) $(-\infty, 1]$

② The number of relations on a set containing 3 element a) 9 b) 81 c) 512 d) 1024

③ The value of $\log_a b \log_b c \log_c a$ a) 2 b) 1 c) 3 d) 4

④ The number of roots of $(x+3)^4 + (x+5)^4 = 16$ is a) 4 b) 2 c) 3 d) 0

⑤ $\cos 1^\circ + \cos 2^\circ + \cdots + \cos 179^\circ =$ a) 0 b) -1 c) 90 d) 1

⑥ The product of "r" consecutive positive integers is divisible by a) r! b) (r-1)! c) (r+1)!

⑦ $100C_{98}$ value? a) 100 b) 4951 c) 4950

⑧ The sequence of $\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}+\sqrt{2}}, \frac{1}{\sqrt{3}+2\sqrt{2}}, \ldots$ form an a) AP b) GP c) HP d) None

⑨ The coefficient of x^6 in $(2+2x)^{10}$ is a) $10C_6$ b) 2^6 c) $10C_6 2^6$ d) $10C_6 2^{10}$

⑩ The image of the point (2, 3) in the line $y = -x$ is a) (-3, -2) b) (-3, 2) c) (3, 2)

⑪ If A is a square matrix then which is not symmetric? a) $A + A^T$ b) $A - A^T$ c) AA^T

⑫ If $|\vec{a}| = 13$, $|\vec{b}| = 5$ and $\vec{a} \cdot \vec{b} = 60$ then $|\vec{a} \times \vec{b}|$ is a) 15 b) 35 c) 25 d) 45

⑬ $\vec{AB} + \vec{AC} = $ —? a) $2\vec{AD}$ b) $\vec{AD}$ c) $3\vec{AD}$ d) 0

⑭ $\lim_{x \to 0} \frac{a^x - b^x}{x} = ?$ a) $\log ab$ b) $\log \frac{a}{b}$ c) $\log \frac{b}{a}$

⑮ $\lim_{x \to \infty} \frac{\sin x}{x}$ value a) 0 b) 1 c) ∞ d) $-\infty$

⑯ $y = \sqrt{x^2}$ then y' a) $\sqrt{2x}$ b) $2\sqrt{x^2}$ c) 1 d) $2x$

⑰ $uv = $ —? a) u' b) $u' + v'$ c) $uv' + vu'$

⑱ $\int x^3 \, dx = ?$ a) $\frac{x^3}{3}$ b) $\frac{x^4}{4}$ c) $3x^2$ d) None

⑲ $\int u \, dv$ formula is a) $uv - du$ b) $u'v$ c) dv d) None

⑳ Ten coins are tossed. The Probability of getting at least 8 heads is a) $7/128$ b) $3/11$ c) $\frac{1}{3}$ d) 0

XI - Public Model Question - 24 Maths

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II. Answer any 7 questions:- [compulsary: 20] 7 x 2 = 14

21) If $n(P(A)) = 1024$, $n(A \cup B) = 15$ and $n(P(B)) = 22$ then find $n(A \cap B)$.

22) Solve: $x = \sqrt{x+20}$, $\forall x \in R$

23) To proove $\sin(45+\theta) - \sin(45-\theta) = \sqrt{2} \sin\theta$.

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

25) Find the distinct permutations of the letters of the word MISSISSIPPI?

26) Find the nearest point on the line $2x + y = 5$ from the origin.

27) To prove that $\begin{vmatrix} 1 & a & a^2 - bc \\ 1 & b & b^2 - ca \\ 1 & c & c^2 - ab \end{vmatrix} = 0$

28) To prove that: $\lim_{n \to \infty} \frac{1 + 2 + 3 + \cdots + n}{3n^2 + 7n + 2} = \frac{1}{6}$

29) Nine coins are tossed once, find the Probability to get at least two heads.

30) Differentiate: i) $y = e^{-mx}$ ii) $(1 - x^2)^{-1/2}$

III. Answer any 7 questions:- [compulsary: 40] 7 x 3 = 21

31) In the set Z of integers, define $m R n$ if $m - n$ is a multiple of 12. prove that R is an equivalence relation.

32) Resolve into partial fractions $\frac{3x+1}{(x-2)(x+1)}$

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33) If the arcs of same lengths in two circles subtend central angles 30° and 45°, find the ratio of their radii

34) If $nP_r = 720$, and $nC_r = 120$, find n, r.

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

36) If the area of the triangle with vertices $(-3,0), (3,0), (0,k)$ is 9 square units find 'k' value?

37) Find the angle between the vectors $2\hat{i} + \hat{j} - \hat{k}$ and $\hat{i} + 2\hat{j} + \hat{k}$ using vector product.

38) Find $\lim_{t \to 0} \dfrac{\sqrt{t^2+9} - 3}{t^2}$

39) if $y = \tan^{-1} x$ to proove $(1+x^2)y'' + (2x-1)y' = 0$

40) state and prove Addition theorem on Probability

V Answer All questions:- $7 \times 5 = 35$

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

[OR] b) If $\sin x = \frac{4}{5}$ (in I quadrant) and $\cos y = \frac{-12}{13}$ (in II quadrant), then find i) $\sin(x-y)$ ii) $\cos(x-y)$

42) a) Using Factor theorem, $\begin{vmatrix} x+1 & 3 & 5 \\ 2 & x+2 & 5 \\ 2 & 3 & (x+4) \end{vmatrix} = (x-1)^2 (x+9)$ prove that.

[OR] b) Evaluate the Integrals. $\dfrac{2x+3}{\sqrt{x^2+4x+1}}$

43) a) Find all values of x in, $\dfrac{2x-3}{(x-2)(x-4)} < 0$

[OR] b) If a, b, c are respectively the p^{th}, q^{th} and r^{th} terms of a GP, show that $(q-r)\log a + (r-p)\log b + (p-q)\log c = 0$.

44) a) show that equat. $4x^2 + 4xy + y^2 - 6x - 3y - 4 = 0$ represents of pair of parallel lines. Find the distance.

[OR] b) The Medians of a triangle are concurrent

45) a) Evaluate :- i) $\lim_{x \to 0} \dfrac{3^x - 1}{\sqrt{x+1} - 1}$ ii) $\lim_{x \to a} \dfrac{x^n - a^n}{x - a} = na^{n-1}$

[OR] b) If $A + B + C = \frac{\pi}{2}$ show that $\cos 2A + \cos 2B + \cos 2C = 1 + 4 \sin A \sin B \sin C$

46) a) By the principle of Mathematical Induction, Prove that, $1 \cdot 2 + 2 \cdot 3 + 3 \cdot 4 + \cdots + n(n+1) = \dfrac{n(n+1)(n+2)}{3}$

[OR] b) Evaluate the integral :- $\int \tan^{-1}\left(\dfrac{2x}{1-x^2}\right)$.

47) a) If $x = a(\theta + \sin\theta)$, $y = a(1 - \cos\theta)$ then prove that at $\theta = \frac{\pi}{2}$, $y'' = \frac{1}{a}$.

[OR] b) The chances of X, Y and Z becoming managers of a certain company are 4 : 2 : 3 the Probabilities that bonus scheme will be introduced if X, Y, and Z become managers are 0.3, 0.5 and 0.4 respectively. If the bonus scheme has been introduced, what is the probability that "Z" was appointed as the manager?

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