QUARTERLY EXAMINATION - SEP 2023

11th Std. **MATHEMATICS** Register No

Time : 3.00 Hrs **MARKS:90**

PART – I

Answer all the questions . **20 X 1 = 20**

1. If $n((A \times B) \cap (A \times C)) = 8$ and $n(B \cap C) = 2$, then $n(A)$ is

1) 6 2) 4 3) 8 4) 16

2. Let $f: \mathbb{R} \to \mathbb{R}$ be defined by $f(x) = 1 - |x|$. Then the range of f is

1) $\mathbb{R}$ 2) $(1, \infty)$ 3) $(-1, \infty)$ 4) $(-\infty, 1]$

3. Let $X = \{1, 2, 3, 4\}$ and $R = \{(1, 1), (1, 2), (1, 3), (2, 2), (3, 3), (2, 1), (3, 1), (1, 4), (4, 1)\}$. Then R is

1) reflexive 2) symmetric 3) transitive 4) equivalence

4. The number of roots of $(x + 3)^4 + (x + 5)^4 = 16$ is

1) 4 2) 2 3) 3 4) 0

5. If 3 is the logarithm of 343, then the base is

1) 5 2) 7 3) 6 4) 9

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

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

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

1) 0 2) 1 3) –1 4) 89

8. Which of the following is not true?

1) $\sin\theta = -\frac{3}{4}$ 2) $\cos\theta = -1$ 3) $\tan\theta = 25$ 4) $\sec\theta = \frac{1}{4}$

9. In a triangle ABC, $\sin^2 A + \sin^2 B + \sin^2 C = 2$, then the triangle is

1) equilateral triangle 2) isosceles triangle 3) right triangle 4) scalene triangle

10. The number of 5 digit numbers all digits of which are odd is

1) 25 2) 5^5 3) 5^6 4) 625

11. $1 + 3 + 5 + 7 + \ldots + 17$ is equal to

1) 101 2) 81 3) 71 4) 61

12. The number of rectangles that a chessboard has .....

1) 81 2) 9^9 3) 1296 4) 6561

13. The n^{th} term of the sequence 1, 2, 4, 7, 11, … is

1) $n^3 + 3n^2 + 2n$ 2) $n^3 - 3n^2 + 3n$ 3) $\frac{n(n+1)(n+2)}{2}$ 4) $\frac{n^2 - n + 2}{2}$

14. The coefficient of x^8y^{12} in the expansion of $(2x + 3y)^{20}$ is

1) 0 2) $2^8 3^{12}$ 3) $2^8 3^{12} + 2^{12} 3^8$ 4) ${}^{20}C_8\, 2^8 3^{12}$

15. If a, 8, b are in AP, a, 4, b are in GP, and if a, x, b are in HP then x is

1) 2 2) 1 3) 4 4) 16

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

a) $\frac{11}{5}$ 2) $\frac{5}{12}$ 3) $\frac{12}{5}$ 4) $-\frac{5}{12}$

17. The equation of the locus of the point whose distance from y-axis is half the distance from origin is

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

18. The intercepts of the perpendicular bisector of the line segment joining (1, 2) and (3, 4) with coordinate axes are

1) 5, -5 2) 5, 5 3) 5, 3 4) 5, -4

19. $(-64)^{2/3}$ is =

1) 16 2) $1/16$ 3) 4 4) $1/4$

20. $tan(60° - A)tanAtan(60° + A)$ *is* =

1) $tan3A$ 2) $tan2A$ 3) $tanA$ 4) $cot3A$

PART – II

Answer any 7 questions. Question No.30 is compulsory. **7 X 2 = 14**

21. If $n(A \cap B) = 3$ and $n(A \cup B) = 10$, then find $n(P(A \Delta B))$.

22. Solve : $|x - 9| < 2$ for x.

23. Find the value of $\cot\left(\frac{-15\pi}{4}\right)$

24. What is the unit digit of the sum $2! + 3! + 4! + ... + 22!$?

25. Write the first 6 terms of the sequences whose n^{th} term a_n is given below

$$a_n = \begin{cases} n & \text{if } n \text{ is } 1,2 \text{ or } 3 \\ a_{n-1} + a_{n-2} + a_{n-3} & \text{if } n > 3 \end{cases}$$

26. Find the middle term in the expansion of $(x + y)^6$

27. Evaluate : $(((256)^{-1/2})^{-1/4})^3$

28. For a set A, $A \times A$ contains 16 elements and two of its elements are (1, 3) and (0, 2). Find the elements of A.

29. Show that $\tan(45° + A) = \frac{1 + \tan A}{1 - \tan A}$

30. Find the equation of the straight line passing through the points (1,1) and (5,8).

PART – III

Answer any 7 questions. Question No.40 is compulsory. **7 X 3 = 21**

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

32. Prove : $\log_{a^2} a \log_{b^2} b \log_{c^2} c = \dfrac{1}{8}$.

33. Show that $\sin^2 \dfrac{\pi}{18} + \sin^2 \dfrac{\pi}{9} + \sin^2 \dfrac{7\pi}{18} + \sin^2 \dfrac{4\pi}{9} = 2$.

34. Find the distinct permutations of the letters of the word MISSISSIPPI?

35. Find the sum: $1 + \dfrac{4}{5} + \dfrac{7}{25} + \dfrac{10}{125} + \ldots\ldots$

36. Find the equations of a parallel line and a perpendicular line passing through the point (1, 2) to the line $3x + 4y = 7$.

37. Find the rank of the word TABLE.

38. *A* and *B* are working on similar jobs but their annual salaries differ by more than Rs 6000. If B earns rupees 27000 per month, then what are the possibilities of A's salary per month?

39. From the curve $y = |x|$, draw (i) $y = |x - 1| + 1$ (ii) $y = |x + 1| - 1$ (iii) $y = |x + 2| + 3$.

40. Write the identities of $\cos 2A$.

PART – IV

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

41. **(a)** Write the values of f at $-4, 1, -2, 7, 0$ if

$$f(x) = \begin{cases} -x+4 & \text{if} \quad -\infty < x \le -3 \\ x+4 & \text{if} \quad -3 < x < -2 \\ x^2 - x & \text{if} \quad -2 \le x < 1 \\ x - x^2 & \text{if} \quad 1 \le x < 7 \\ 0 & \text{otherwise} \end{cases}$$

(OR)

(b) If ${}^{(n+2)}C_7 : {}^{(n-1)}P_4 = 13 : 24$ find n.

42. **(a)** Solve : $\dfrac{x^2 - 4}{x^2 - 2x - 15} \le 0$.

(OR)

(b) Prove that $\sqrt[3]{x^3 + 7} - \sqrt[3]{x^3 + 4}$ is approximately equal to $\dfrac{1}{x^2}$ when x is large.

43. **(a)** If $A + B = 45°$, show that $(1 + \tan A)(1 + \tan B) = 2$.

(OR)

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

44. **(a)** By the principle of mathematical induction, prove that, for all integers $n \geq 1$,

$$1 + 2 + 3 + \cdots + n = \frac{n(n+1)}{2}$$

(OR)

(b) Resolve into partial fractions: $\frac{x^3 + 2x + 1}{x^2 + 5x + 6}$.

45. **(a)** If $f: R \to R$ is defined by $f(x) = 2x - 3$ prove that f is a bijection and find its inverse.

(OR)

(b) Express the equation $\sqrt{3}x - y + 4 = 0$ in the following equivalent form:

(i) Slope and Intercept form (ii) Intercept form (iii) Normal form

46. **(a)** If a, b, c are respectively the p^{th}, q^{th} and r^{th} terms of a GP, show that

$(q - r)\log a + (r - p)\log b + (p - q)\log c = 0$.

(OR)

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

47. **(a)** If $\frac{\log x}{y - z} = \frac{\log y}{z - x} = \frac{\log z}{x - y}$, then prove that $xyz = 1$

(OR)

(b) On the set of natural numbers let R be the relation defined by aRb if $2a + 3b = 30$. Write down the relation by listing all the pairs. Check whether it is

i) reflexive (ii) symmetric (iii) transitive (iv) equivalence