

## COMMON QUARTERLY EXAMINATION - 2024

\*

Standard XI

Reg.No. 

11	C	1	0	3	8
----	---	---	---	---	---

## MATHEMATICS

Time : 3.00 hrs

Part - I

Marks : 90

20 x 1 = 20

I. Choose the correct 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  $R$  be the universal relation on a set  $x$  with more than one element. Then  $R$  is
  - a) not reflexive
  - b) not symmetric
  - c) transitive
  - d) none of the above
3. If  $n(A) = 2$  and  $n(B \cup C) = 3$ , then  $n[(A \times B) \cup (A \times C)]$  is
  - a)  $2^3$
  - b)  $3^2$
  - c) 6
  - d) 5
4. The solution of  $5x - 1 < 24$  and  $5x + 1 > -24$  is
  - a) (4,5)
  - b) (-5,-4)
  - c) (-5,5)
  - d) (-5,4)
5. If  $a$  and  $b$  are the real roots of the equation  $x^2 - kx + c = 0$ , then the distance between the points  $(a,0)$  and  $(b,0)$  is
  - a)  $\sqrt{k^2 - 4c}$
  - b)  $\sqrt{4k^2 - c}$
  - c)  $\sqrt{4c - k^2}$
  - d)  $\sqrt{k - 8c}$
6. The value of  $\log_a b \log_b c \log_c a$  is
  - a) 2
  - b) 1
  - c) 3
  - d) 4
7. 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) 9
  - d) 4
8. Which of the following is not true?
  - a)  $\sin \theta = -\frac{3}{4}$
  - b)  $\cos \theta = 25$
  - c)  $\tan \theta = \frac{1}{4}$
  - d)  $\sec \theta = -1$
9. If  $f(\theta) = |\sin \theta| + |\cos \theta|$ ,  $\theta \in R$ , then  $f(\theta)$  is in the interval
  - a)  $[0,2]$
  - b)  $[1, \sqrt{2}]$
  - c)  $[1,2]$
  - d)  $[0,1]$
10. A wheel is spinning at 2 radian / second. How many seconds will it take to make 10 complete rotations?
  - a)  $10\pi$  seconds
  - b)  $20\pi$  seconds
  - c)  $5\pi$  seconds
  - d)  $15\pi$  seconds
11. 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
12. There are 10 points in a plane and 4 of them are collinear. The number of straight lines joining any two points
  - a) 45
  - b) 40
  - c) 39
  - d) 38

13. Number of sides of a polygon having 44 diagonals is  
 a) 4                                      b) 4!                                      c) 11                                      d) 22
14.  $1 + 3 + 5 + 7 + \dots + 19$  is equal to  
 a) 100                                      b) 81                                      c) 71                                      d) 61
15. If  $a$  is the arithmetic mean and  $g$  is the geometric mean of two numbers, then  
 a)  $a \leq g$                                       b)  $a \geq g$                                       c)  $a = g$                                       d)  $a > g$
16. The remainder when  $38^{15}$  is divided by 13 is  
 a) 12                                      b) 1                                      c) 11                                      d) 5
17. The sum of an infinite G.P is 18. If the first term is 6, the common ratio is  
 a)  $\frac{1}{3}$                                       b)  $\frac{2}{3}$                                       c)  $\frac{1}{6}$                                       d)  $\frac{3}{4}$
18. Which of the following point lie on the locus of  $3x^2 + 3y^2 - 8x - 12y + 17 = 0$   
 a) (0,0)                                      b) (-2,3)                                      c) (1,2)                                      d) (0,-1)
19. 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)
20. 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

## Part - II

II. Answer any 7 questions. (Q.No.30 is compulsory)

7 x 2 = 14

21. Let  $A = \{a, b, c\}$ . What is the equivalence relation of smallest cardinality on  $A$ ? What is the equivalence relation of largest cardinality on  $A$ ?
22. Solve :  $|5x - 12| < -2$
23. Evaluate :  $\left( \left( (256)^{-\frac{1}{2}} \right)^{-\frac{1}{4}} \right)^3$
24. Find the value of  $\sin(765^\circ)$
25. Show that  $\tan(45^\circ + A) = \frac{1 + \tan A}{1 - \tan A}$
26. If  $\frac{1}{7!} + \frac{1}{8!} = \frac{A}{9!}$ , then find the value of  $A$ .
27. Evaluate the following : i)  $10C_3$       ii)  $100C_{99}$
28. Find the middle term in the expansion of  $(x + y)^6$
29. Write the first 6 terms of the exponential series  $e^{-2x}$

3

XI Maths

30. Find the perpendicular distance from the origin to the line  $x + y = 1$

## Part - III

III. Answer any 7 questions. (Q.No.40 is compulsory)

7 x 3 = 21

31. Let  $f, g : \mathbb{R} \rightarrow \mathbb{R}$  be defined as  $f(x) = 2x - |x|$  and  $g(x) = 2x + |x|$ . Find  $f \circ g$ .
32. Resolve into partial fractions :  $\frac{x}{(x+3)(x-4)}$
33. If  $\alpha$  and  $\beta$  are the roots of the quadratic equation  $x^2 + \sqrt{2}x + 3 = 0$ , form a quadratic polynomial with zeros  $\frac{1}{\alpha}, \frac{1}{\beta}$ .
34. Show that  $\frac{\sin 75^\circ - \sin 15^\circ}{\cos 75^\circ + \cos 15^\circ} = \frac{1}{\sqrt{3}}$
35. Find the distinct permutations of the letters of the word MISSISSIPPI.
36. Prove that  $10C_2 + 2(10C_3) + 10C_4 = 12C_4$
37. Write the first 6 terms of the sequences whose  $n^{\text{th}}$  term is  $a_n = \begin{cases} 1 & \text{if } n=1 \\ 2 & \text{if } n=2 \\ a_{n-1} + a_{n-2} & \text{if } n > 2 \end{cases}$
38. Compute the sum of first  $n$  terms of the following series :  
 $6 + 66 + 666 + 6666 + \dots$
39. Show the points  $\left(0, \frac{-3}{2}\right)$ ,  $(1, -1)$  and  $\left(2, \frac{-1}{2}\right)$  are collinear.
40. Find the value of  $\tan^{-1} \sqrt{3} + \cos^{-1} \frac{\sqrt{3}}{2}$

## Part - IV

IV. Answer all the questions.

7 x 5 = 35

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

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

(OR)

- b) If  $A + B = 45^\circ$ , show that  $(1 + \tan A)(1 + \tan B) = 2$

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

(OR)

b) Find all values of  $x$  that satisfies the inequality  $\frac{2x-3}{(x-2)(x-4)} < 0$

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

(OR)

b) By the principle of mathematical induction, prove that, for all integers  $n \geq 1$

$$1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

44. a) If  $A \times A$  has 16 elements  $S = \{(a,b) \in A \times A : a < b\}$ ,  $(-1,2)$  and  $(0,1)$  are two elements of  $S$ , then find the remaining elements of  $S$ .

(OR)

b) If the equation  $\lambda x^2 - 10xy + 12y^2 + 5x - 16y - 3 = 0$  represents a pair of straight lines, then find the value of  $\lambda$  and the separate equations of the lines.

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

(OR)

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

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

(OR)

b) If  $A + B + C = 180^\circ$ , prove that  $\sin 2A + \sin 2B + \sin 2C = 4 \sin A \sin B \sin C$

47. a) Find the co-efficient of  $x^2$  and the co-efficient of  $x^6$  in  $\left(x^2 - \frac{1}{x^3}\right)^6$

(OR)

b) Find the largest possible domain for the real valued function given by

$$f(x) = \frac{\sqrt{9-x^2}}{\sqrt{x^2-1}}$$

\*\*\*\*\*