FTS

10 - STD

QUARTERLY EXAMINATION - 2023

MATHEMATICS

Time : 3.00 Hrs

Marks : 100

I **Answer all the questions.** 14 X 1= 14

1. A = {a,b,p}, B = {2,3}, C = {p,q,r,s} then n[(A ∪ C) X B] is
   a) 8 b) 20 c) 12 d) 16
2. Domain of the function f(x) = $\frac{1}{x+1}$ is
   a) Z - {1} b) R - {1} c) R - {-1} d) Z - {-1}
3. $f(x) = (x + 1)^3 - (x - 1)^3$ represents a function which is
   a) linear b) cubic c) reciprocal d) quadratic
4. Using Euclid's division lemma, if the cube of any positive integer is divided by 9 then the possible remainders are a) 0,1,8 b) 1,4,8 c) 0,1,3 d) 1,3,5
5. If m = ab, $n = am^2$ then the GCD and LCM of (m,n) are
   a) (m,m) b) (n,n) c) (n,m) d) (m,n)
6. An A.P consists of 31 terms. If its 16th term is m, then the sum of all the terms of this A.P is
   a) 16m b) 62m c) 31m d) $\frac{31}{2}$ m
7. The value of $(1^3+2^3+3^3+.....+15^3) - (1 + 2 + 3 + ... + 15)$ is
   a) 14400 b) 14200 c) 14280 d) 14520
8. If (x - 6) is the HCF of $x^2 - 2x - 24$ and $x^2 - kx - 6$ then the value of k is
   a) 3 b) 5 c) 6 d) 8
9. The solution of $(2x - 1)^2 = 9$ is equal to a) -1 b) 2 c) -1,2 d) none of these
10. The number of points of intersection of the quadratic polynomial $x^2 + 4x + 4$ with the x axis is
    a) 0 b) 1 c) 0 or 1 d) 2
11. All the non - diagonal elements in any unit matrix are
    a) 1 b) 0 c) positive d) negative
12. The perpendicular bisector of a side of a triangle and the angle bisector of the angle opposite to that side meets at a) circum circle b) in circle c) ortho centre d) centroid
13. Two poles of heights 6m and 11 m stand vertically on a plane ground. If the distance between their feet is 12m, what is the distance between their tops?
    a) 13 m b) 14 m c) 15 m d) 12.8 m
14. The two tangents from an external points P to a circle with centre at O are PA and PB. If ∠APB = 70° then the value of ∠AOB is a) 100° b) 110° c) 120° d) 130°

II **Answer any 10 of the following. Question No. 28 is compulsory.** 10 X 2 = 20

15. Represent the relation {(x,y) / y = x + 3, x,y are natural numbers < 10} by
    i) an arrow diagram ii) a set in roster form
16. If A = {-2,-1,0, 1, 2} and f : A → B is an onto function defined by $f(x) = x^2 + x + 1$ then find B.
17. Prove that two consecutive positive integers are always coprime.
18. The general term of a sequence is defined as $a_n = \begin{cases} n(n+3); & n \in N \text{ is odd} \\ n^2+1; & n \in N \text{ is even} \end{cases}$ find the eleventh and eighteenth terms.
19. If $1^3 + 2^3 + 3^3 + ... + k^3 = 44100$ then find 1 + 2 + 3 + ... + k.
20. Reduce the rational expression $\frac{x^2-11x+18}{x^2-4x+4}$ to its lowest form.
21. Determine the nature of roots for the following quadratic equation $2x^2 - 2x + 9 = 0$.
22. Write the following expression in terms of $\alpha+\beta$ and $\alpha\beta$ $\frac{\alpha}{3\beta}+\frac{\beta}{3\alpha}$.

23. Find the value of a,b,c,d from the equation $\begin{pmatrix} a-b & 2a+c \\ 2a-b & 3c+d \end{pmatrix} = \begin{pmatrix} 1 & 5 \\ 0 & 2 \end{pmatrix}$.

24. If $A = \begin{pmatrix} 0 & 4 & 9 \\ 8 & 3 & 7 \end{pmatrix}$ $B = \begin{pmatrix} 7 & 3 & 8 \\ 1 & 4 & 9 \end{pmatrix}$ find the value of B-5A.

25. If ΔABC is similar to ΔDEF such that BC = 3 cm, EF = 4cm and area of ΔABC =54cm². Find the area of ΔDEF.

26. A man goes 18m due east and then 24m due north. Find the distance of his current position form the starting point?

27. State : Alternate segment theorem.

28. If A = {1,2,3,4} and B = {6,9} write the function f from A to B such that f = {(x,y) / difference between x and y is odd, $x \in A$, $y \in B$} in roster form

III Answer any 10 f the following. Question No. 42 is compulsory. 10 X 5 = 50

29. Let A = {$x \in w / x < 2$}, B = {$x \in N / 1 < x \leq 4$} and C = {3, 5} verify that A X (B $\cup$ C) = (A X B) $\cup$ (A X C).

30. If the function f is defined by $f(x) = \begin{cases} x+2; & x>1 \\ 2; & -1 \leq x \leq 1 \\ x-1; & -3<x<-1 \end{cases}$ find the values of

i) f(3) ii) f(0) iii) f(-1.5) iv) f(2) + f(-2)

31. If f(x) = 2x + 3, g(x) = 1-2x and h(x) = 3x. Prove that fo(goh) = (fog)oh.

32. Find the greatest number consisting of 6 digits which is exactly divisible by 24, 15, 36 ?

33. The sum of first n, 2n and 3n terms of an A.P. are S_1, S_2 and S_3 respectively. Prove that $S_3 = 3(S_2 - S_1)$.

34. Find the sum of the Geometric series 3 + 6 + 12 + ... + 1536.

35. Solve the following system of linear equations in three variables.
x + y + z = 5; 2x - y + z = 9; x - 2y + 3z = 16.

36. Find the square root of $64x^4 - 16x^3 + 17x^2 - 2x + 1$.

37. A bus covers a distance of 90km at a uniform speed. Had the speed been 15km / hour more it would have taken 30 minutes less for the journey. Find the original speed of the bus.

38. Solve for x,y : $\begin{pmatrix} x^2 \\ y^2 \end{pmatrix} + 2\begin{pmatrix} -2x \\ -y \end{pmatrix} = \begin{pmatrix} 5 \\ 8 \end{pmatrix}$.

39. If $A = \begin{pmatrix} 1 & 2 & 1 \\ 2 & -1 & 1 \end{pmatrix}$, $B = \begin{pmatrix} 2 & -1 \\ -1 & 4 \\ 0 & 2 \end{pmatrix}$ show that $(AB)^T = B^T.A^T$.

40. State and prove Thales theorem.

41. Show that the angle bisectors of a triangle are concurrent.

42. If 5th, 12th and 15th terms of an A.P are x,y,z respectively then find the value of 3x - 10y + 7z.

IV Answer all the questions. 2 X 8 = 16

43. a) Draw the two tangents from a point which is 5cm away from the centre of a circle of diameter 6cm. Also measure the lengths of the tangents. ***(OR)***
b) Construct a ΔPQR which the base PQ = 4.5cm, $\angle R = 35^\circ$ and the median from R to RG is 6cm.

44. a) Discuss the nature of solution of the following quadratic equation $x^2 - 9x + 20 = 0$. ***(OR)***
b) A garment shop announces a flat 50% discount on every purchase of items for their customers. Draw the graph for the relation between the marked price and discount.
i) the marked price when a customer gets a discount of Rs. 3250 (from graph)
ii) The discount when the marked price is Rs. 2500.