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## QUARTERLY EXAMINATION - 2024

## MATHEMATICS

Marks : 100

Time : 3.00 Hours

14x1=14

I. Answer all the questions. Each question carries one mark each.

1. If  $A=\{1,2\}$ ,  $B=\{1,2,3,4\}$ ,  $C=\{5,6\}$  and  $D=\{5,6,7,8\}$  then state which of the following statement is true  
a)  $(A \times C) \subset (B \times D)$  b)  $(B \times D) \subset (A \times C)$  c)  $(A \times B) \subset (A \times D)$  d)  $(D \times A) \subset (B \times A)$
2. If  $f(x)=2x^2$  and  $g(x)=\frac{1}{3x}$  then  $f \circ g$  is  
a)  $\frac{3}{2x^2}$  b)  $\frac{2}{3}x^2$  c)  $\frac{2}{9x^2}$  d)  $\frac{1}{6x^2}$
3. 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
4. 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)  $\frac{31}{2}m$
5.  $y^2 + \frac{1}{y^2}$  is not equal to a)  $\frac{y^4+1}{y^2}$  b)  $(y+\frac{1}{y})^2$  c)  $(y-\frac{1}{y})^2+2$  d)  $(y+\frac{1}{y})^2-2$
6. The values of a and b if  $4x^4 - 24x^3 + 76x^2 + ax + b$  is a perfect square are  
a) 100, 120 b) 10, 12 c) -120, 100 d) 12, 10
7. 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
8. The zeros of the quadratic expression  $x^2+8x+12$  is  
a) 2, 6 b) -2, -6 c) -2, 6 d) 2, -6
9. In  $\triangle LMN$ ,  $\angle L=60^\circ$ ,  $\angle M=50^\circ$ , if  $\triangle LMN \sim \triangle PQR$  then the value of  $\angle R$  is  
a)  $40^\circ$  b)  $70^\circ$  c)  $30^\circ$  d)  $110^\circ$
10. If in  $\triangle ABC$ ,  $BC \parallel DE$ ,  $AB=3.6\text{cm}$ ,  $AC=2.4\text{cm}$  and  $AD=2.1\text{cm}$  then the length of AE is  
a) 1.4cm b) 1.8cm c) 1.2cm d) 1.05cm
11. The straight line given by the equation  $x=11$  is  
a) parallel to X axis b) parallel to Y axis  
c) passing through the origin d) passing through the point (0,11)
12. The slope of the line joining (12,3), (4,a) is  $\frac{1}{8}$ . The value of a is : a) 1 b) 4 c) -5 d) 2
13. If  $\sin\theta + \cos\theta = a$  and  $\sec\theta + \csc\theta = b$  then the value of  $b(a^2-1)$  is equal to  
a) 2a b) 3a c) 0 d) 2ab
14. The X intercept and Y intercept of the following straight line  $3x-4y+2=0$  is  
a)  $-\frac{2}{3}, \frac{1}{2}$  b)  $-\frac{12}{5}, -\frac{1}{2}$  c)  $\frac{2}{3}, \frac{1}{2}$  d)  $\frac{2}{3}, -\frac{1}{2}$
- II. Answer any 10 of the following questions. 28th question is a compulsory one. Each question carries 2 marks each. 10x2=20
15. If  $B \times A = \{(-2,3), (-2,4), (0,3), (0,4), (3,3), (3,4)\}$  find A and B.
16. A relation R is given by the set  $\{(x,y)/y=x+3, x \in \{0,1,2,3,4,5\}\}$ . Determine the domain and range.
17. Let  $A=\{1,2,3\}$ ,  $B=\{4,5,6,7\}$  and  $f=\{(1,4),(2,5),(3,6)\}$  be a function from A to B show that f is one-one but not onto function.
18. 'a' and 'b' are two positive integers such that  $a^b \times b^a = 800$  find 'a' and 'b'.

19. Find the 19th term of an AP  $-11, -15, -19, \dots$
20. Find the Sum :  $3+1+\frac{1}{3}+\dots\infty$
21. Simplify :  $\frac{x^2}{x-y} + \frac{y}{y-x}$
22. Determine the quadratic equations whose sum and product of the roots are  $\frac{5}{3}, 4$ .
23. Determine the nature of the roots of the quadratic equation  $2x^2-2x+9=0$
24. A vertical stick of length 6m casts a shadow 400cm long on the ground and at the same time a tower casts a shadow of 28m long. Using similarity, find the height of the tower.
25. Find the area of the triangle whose vertices are  $(-3, 5)$   $(5,6)$  and  $(5,-2)$
26. Find the equation of the straight line has slope  $-\frac{5}{4}$  and passing through the points  $(-1,2)$
27. Prove that  $\tan^2\theta - \sin^2\theta = \tan^2\theta \cdot \sin^2\theta$
28. A relation  $X \rightarrow Y$  is defined by  $f(x)=x^2-2$  where  $X=\{-2,-1,0,3\}$  and  $Y=R$  then find the elements of  $f$ .

III. Answer any 10 of the following questions. 42 is a compulsory one. Each question carries 5 marks each. 10x5=50

29. Let  $A=\{x \in N/1 < x < 4\}$ ,  $B=\{x \in W/0 \leq x < 2\}$  and  $C=\{x \in N/x < 3\}$  then verify that  
1.  $A \times (B \cup C) = (A \times B) \cup (A \times C)$     2.  $A \times (B \cap C) = (A \times B) \cap (A \times C)$
30. Let  $f:A \rightarrow B$  be a function defined by  $f(x) = \frac{x}{2} - 1$ , where  $A=\{2,4,6,10,12\}$ ,  $B=\{0,1,2,4,5,9\}$ . Represent  $f$  by  
(i) set of ordered pairs (ii) a table (iii) an arrow diagram (iv) a graph
31. If  $f(x)=2x+3$ ,  $g(x)=1-2x$  and  $h(x)=3x$  prove that  $f \circ (g \circ h) = (f \circ g) \circ h$
32. Find the HCF of 396, 504, 636.
33. The sum of three consecutive terms that are in AP is 27 and their product is 288. Find the three terms.
34. Find the sum to 'n' terms of the series  $5+55+555+\dots$
35. Find the GCD of  $6x^3-30x^2+60x-48$  and  $3x^3-12x^2+21x-18$ .
36. If  $9x^4+12x^3+28x^2+ax+b$  is a perfect square find the value of  $a$  and  $b$ .
37. From a group of  $2x^2$  black bees, square root of half of the group went to tree. Again eight-ninth of the bees went to the same tree. The remaining two got caught up in a fragrant lotus. How many bees were there in total.
38. Find the area of the quadrilateral whose vertices are at  $(-9,0)$   $(-8,6)$   $(-1,-2)$  and  $(-6,-3)$ .
39. A line makes positive intercepts on co-ordinate axes whose sum is 7 and it passes through  $(-3,8)$ . Find the equation.
40. Find the equation of the perpendicular bisector of the line joining the points  $A(-4,2)$  and  $B(6,-4)$
41. Prove that  $\tan^2 A - \tan^2 B = \frac{\sin^2 A - \sin^2 B}{\cos^2 A \cos^2 B}$     42. State and prove Thales theorem.

IV. Answer the following questions. Each question carries 8 marks each. 2x8=16

43. a) Construct a triangle similar to a given triangle ABC with its sides equal to  $\frac{6}{5}$  of the corresponding sides of the triangle ABC (scale factor  $\frac{6}{5} > 1$ ) (OR)  
b) Construct a triangle PQR such that  $QR=5\text{cm}$ ,  $\angle P=30^\circ$ , and the altitude from P to QR it's length 4.2cm.
44. a) Draw a graph  $xy=24$ ,  $x,y > 0$ . Using the graph find (i)  $y$  when  $x=3$  and (ii)  $x$  when  $y=6$ . (OR)  
b) A two wheeler parking zone near bus stand charges as below

Time (in hours) (x)	4	8	12	24
Amount ₹ (y)	60	120	180	360

Check if the amount charged are in direct variation or in inverse variation to the parking time. Graph the data. Also (i) find the amount to be paid when parking time is 6 hr; (ii) find the parking duration when the amount paid is ₹ 150.