

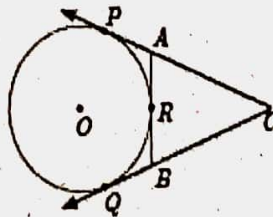
## PART- I (Marks - 14)

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Note: i) Answer All the 14 questions

ii) Choose the most suitable answer from given the four alternatives and write the option code with the corresponding answers. 14 x 1 = 14

- Let  $n(A) = m$  and  $n(B) = n$  then the total number of non-empty relations that can be defined from  $A$  to  $B$  is  
(A)  $m^n$  (B)  $n^m$  (C)  $2^{mn} - 1$  (D)  $2^{mn}$
- $A = \{a, b, p\}$ ,  $B = \{2, 3\}$ ,  $C = \{p, q, r, s\}$  then;  $n[(A \cup C) \times B]$  is  
(A) 8 (B) 20 (C) 12 (D) 16
- 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
- The next term of the sequence  $\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \frac{1}{18}, \dots$  is  
(A)  $\frac{1}{24}$  (B)  $\frac{1}{27}$  (C)  $\frac{2}{3}$  (D)  $\frac{1}{81}$
- 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
- The solution of  $(2x-1)^2 = 9$  is equal to  
(A) -1 (B) 2 (C) -1, 2 (D) None of these
- If number of columns and rows are not equal in a matrix then it is said to be a  
(A) diagonal matrix (B) rectangular matrix  
(C) square matrix (D) identity matrix
- In figure  $CP$  and  $CQ$  are tangents to a circle with centre at  $O$ .  $ARB$  is another tangent touching the circle at  $R$ . If  $CP = 11$  cm and  $BC = 7$  cm, then the length of  $BR$  is



- (A)  $80^\circ$  (B)  $85^\circ$  (C)  $75^\circ$  (D)  $90^\circ$

9. When proving that a quadrilateral is a trapezium, it is necessary to show
- (A) Two sides are parallel. (B) Two parallel and two non-parallel sides.  
 (C) Opposite sides are parallel. (D) All sides are of equal length.
10. If  $x = a \cos \theta$  and  $y = b \sin \theta$  then
- (A)  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$  (B)  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  (C)  $\frac{y^2}{b^2} - \frac{x^2}{a^2} = 1$  (D)  $\frac{y^2}{b^2} - \frac{x^2}{a^2} = 0$
11. If the radius of the base of a cone is tripled and the height is doubled then the volume is
- (A) made 6 times (B) made 18 times (C) made 12 times (D) unchanged
12. The ratio of the volumes of a cone, a cylinder and a sphere, if each has the same diameter and same height is
- (A) 1:2:3 (B) 2:1:3 (C) 1:3:2 (D) 3:1:2
13. The Range of the data 8, 8, 8, 8, 8 .....8 is
- (A) 0 (B) 1 (C) 8 (D) 3
14. Two dice are rolled together. Find the probability of getting a sum of faces as prime number.
- (A)  $\frac{1}{6}$  (B)  $\frac{5}{12}$  (C)  $\frac{1}{2}$  (D)  $\frac{7}{9}$

**PART - II (Marks - 20)**

**Note: Answer TEN questions. Question Number 28 is compulsory.**

**10 x 2 = 20**

15. Represent the function  $f = \{(1, 2), (2, 2), (3, 2), (4, 3), (5, 4)\}$  through
- (i) a table form (ii) an arrow diagram

16. Find the domain of the function  $f(x) = \sqrt{1 + \sqrt{1 - \sqrt{1 - x^2}}}$

17. Find the least number that is divisible by the first ten natural numbers.

18. If  $1^3 + 2^3 + 3^3 + \dots + k^3 = 44100$ , then find  $1 + 2 + 3 + \dots + k$

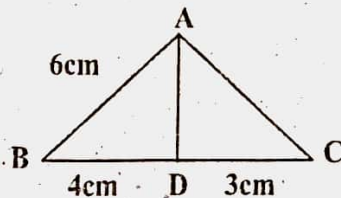
19. Simplify:-  $\frac{p^2 + p - 12}{p - 4} \times \frac{p + 3}{p^2 - 3^2}$

20. If  $A = \begin{pmatrix} 5 & 2 & 2 \\ -\sqrt{17} & 0.7 & \frac{5}{2} \\ 8 & 3 & 1 \end{pmatrix}$ , then prove that  $(A^T)^T = A$

21. If  $\alpha$  and  $\beta$  are the roots of the equation  $3x^2 - 6x + 4 = 0$ , find the value of  $\alpha^2 + \beta^2$



22. In the Figure,  $AD$  is the bisector of  $\angle A$ . If  $BD = 4$  cm,  $DC = 3$  cm and  $AB = 6$  cm, find  $AC$ .



23. The vertices of  $\triangle ABC$  are  $A(2, 1)$ ,  $B(6, -1)$  and  $(4, 11)$ . Find the equation of the straight line along the altitude from the vertex  $A$ .

24. Prove that  $\frac{1 - \tan^2 \theta}{\cot^2 \theta - 1} = \tan^2 \theta$

25. Find the diameter of a sphere whose surface area is  $154 \text{ m}^2$ .

26. The ratio of the volumes of two cones is  $2:3$ . Find the ratio of their radii if the height of second cone is double the height of the first.

27. An integer is chosen at random from 1 to 100. Find the probability that the number is perfect square.

28. Find the slope and  $y$  intercept of  $\sqrt{3}x + (1 - \sqrt{3})y = 3$ .

#### PART - III (Marks - 50)

Note: Answer TEN questions. Question Number 42 is compulsory.

10 x 5 = 50

29. Given  $A = \{1, 2, 3\}$ ,  $B = \{2, 3, 5\}$ ,  $C = \{3, 4\}$  and  $D = \{1, 3, 5\}$  check if  $(A \cap C) \times (B \cap D) = (A \times B) \cap (C \times D)$  is true?

30. Find  $x$ , if  $gff(x) = fgg(x)$ , given  $f(x) = 3x + 1$  and  $g(x) = x + 3$

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

32. Find the sum to  $n$  terms of the series  $3 + 33 + 333 + \dots$

33. There are 12 pieces of five, ten and twenty rupee currencies whose total value is ₹105. When first 2 sorts are interchanged in their numbers its value will be increased by ₹20. Find the number of currencies in each sort.

34. Find the square root of  $121x^4 - 198x^3 - 183x^2 + 216x + 144$

35. If  $A = \begin{pmatrix} 1 & 2 \\ 1 & 3 \end{pmatrix}$  and  $B = \begin{pmatrix} 4 & 0 \\ 1 & 5 \end{pmatrix}$  then, show that  $(A - B)^T = A^T - B^T$

36. State and prove Pythagoras theorem

37. If  $(x, y)$  is any point on the line segment joining the points  $(a, 0)$  and  $(0, b)$  then prove that

$$\frac{x}{a} + \frac{y}{b} = 1, \text{ where } a, b \neq 0$$

38. From the top of a 12 m high building, the angle of elevation of the top of a cable tower is  $60^\circ$  and the angle of depression of its foot is  $30^\circ$ . Determine the height of the tower.
39. An industrial metallic bucket is in the shape of the frustum of a right circular cone whose top and bottom diameters are 10 m and 4 m and whose height is 4 m. Find the curved and total surface area of the bucket.
40. A hemispherical bowl of radius 30 cm is filled with soap paste. If this paste is made into cylindrical soap cakes each of radius 5 cm and height 2 cm, how many cakes do we get?  
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41. The time taken (in minutes) to complete a homework by 8 students in a day are given by 38, 40, 47, 44, 46, 43, 49, 53. Find the coefficient of variation.
42. Find the equation of a straight line through the point of intersection of the lines  $8x+3y=18$ ,  $4x+5y-9=0$  and bisecting the line segment joining the points  $(5, -4)$  and  $(-7, 6)$ .

#### PART - IV (Marks- 16)

Note: Answer both questions.

2 x 8 = 16

43. (A). Construct a  $\triangle PQR$  in which  $PQ=8$  cm,  $\angle R=60^\circ$  and the median  $RG$  from  $R$  to  $PQ$  is 5.8 cm. Find the length of the altitude from  $R$  to  $PQ$ .

OR

- (B). Draw the two tangents from a point which is 10 cm away from the centre of a circle of radius 5 cm. Also, measure the lengths of the tangents.

44. (A). Nishanth is the winner in a Marathon race of 12 km distance. He ran at the uniform speed of 12 km/hr and reached the destination in 1 hour. He was followed by Aradhana, Ponmozhi, Jeyanth, Sathya and Swetha with their respective speed of 6 km/hr, 4 km/hr, 3 km/hr and 2 km/hr. And, they covered the distance in 2 hrs, 3 hrs, 4 hrs and 6 hours respectively.

Draw the speed-time graph and use it to find the time taken to Kaushik with his speed of 2.4 km/hr.

OR

- (B). Draw the graph of  $y = x^2 - 4x + 3$  and hence find the roots of  $x^2 - 6x + 9 = 0$ .