

TIME: 3.00 Hrs

PART- I (Marks - 14)

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.  $14 \times 1 = 14$

1.  $A = \{a, b, p\}$ ,  $B = \{2, 3\}$ ,  $C = \{p, q, r, s\}$  then;  $n[(A \cup C) \times B]$  is  
(A) 8 (B) 20 (C) 12 (D) 16
2. 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
3. The next term of the sequence  $\frac{3}{16}, \frac{1}{81}, \frac{1}{21}, \frac{1}{8}, \dots$  is  
a)  $\frac{1}{24}$  b)  $\frac{1}{27}$  c)  $\frac{2}{3}$  d)  $\frac{1}{81}$
4. 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
5. GCD of  $6x^2y$ ,  $9x^2yz$ ,  $12x^2y^2z$  is  
a)  $36xy^2z^2$  b)  $36x^2y^2z$  c)  $36x^2y^2z^2$  d)  $3x^2y$
6. 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
7.  $3\sqrt{x} = 9$  then value of  $x$  is  
(a) 3 (b) 9 (c) 1 (d)  $\frac{1}{3}$
8. The two tangents from an external points P to a circle with centre at O are PA and PB. If  $\angle APB = 70^\circ$  then the value of  $\angle AOB$  is  
(a)  $100^\circ$  (b)  $110^\circ$  (c)  $120^\circ$  (d)  $130^\circ$
9. The point of intersection of  $3x - y = 4$  and  $x + y = 8$  is  
(a) (5, 3) (b) (2, 4) (c) (3, 5) (d) (4, 4)
10.  $(\cot \theta + \operatorname{cosec} \theta)(\cot \theta - \operatorname{cosec} \theta)$  is  
(a) 1 (b) 0 (c) -1 (d)  $2\cot \theta$

11. A tower is 60 m height. Its shadow is x metres shorter when the sun's altitude is  $45^\circ$  than when it has been  $30^\circ$ , then x is equal to  
 (a) 41.92m (b) 43.92m (c) 43m (d) 45.6 m
12. In a hollow cylinder, the sum of the external and internal radii is 14cm and the width is 4 cm. If its height is 20 cm, the volume of the material in it is  
 (a)  $5600 \pi \text{cm}^3$  (b)  $11200 \pi \text{cm}^3$  (c)  $56 \pi \text{cm}^3$  (d)  $3600 \pi \text{cm}^3$
13. The ratio of the volumes of a cylinder, a cone 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
14. If  $P(A \cap B) = 0.3$ .  $P(\bar{A} \cap B) = 0.45$  then value of P(B)  
 a) 0.14 b) 0.30 c) 0.75 d) 1

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

10 x 2 = 20

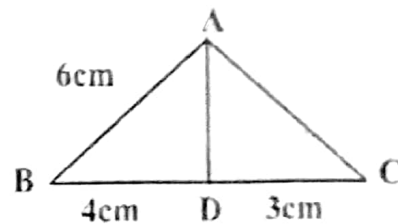
**Note: Answer TEN questions. Question Number 28 is compulsory.**

15. Let  $A = \{1, 2, 3, 7\}$  and  $B = \{3, 0, -1, 7\}$ , which of the following are relation from A to B? (i)  $R_1 = \{(2, 1), (7, 1)\}$  (ii)  $R_2 = \{(-1, 1)\}$
16. Find the domain of the function  $f(x) = \sqrt{1 + \sqrt{1 - \sqrt{-x^2}}}$
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  $\Delta ABC$  are  $A(2, 1)$ ,  $B(6, -1)$  and  $C(4, 11)$ . Find the equation of the straight line along the altitude from the vertex A.
24. Prove the identity  $\sec^6\theta = \tan^6\theta + 3 \tan^2\theta \sec^2\theta + 1$ .
25. A player sitting on the top of a tower of height 20 m observes the angle of depression of a ball lying on the ground as  $60^\circ$ . Find the distance between the foot of the tower and the ball. ( $\sqrt{3} = 1.732$ ).
26. Find the volume of a cylinder whose height is 2 m and whose base area is  $250 \text{ m}^2$ .
27. What is the probability that a leap year selected at random will contain 53 Saturdays.
28. Find the G.P in which the 2<sup>nd</sup> term is  $\sqrt{6}$  and the 6<sup>th</sup> term is  $9\sqrt{6}$ .

**PART - III (Marks - 50)**

**Note: Answer TEN questions. Question Number 42 is compulsory.  $10 \times 5 = 50$**

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 Rs.105. When first 2 sorts are interchanged in their numbers its value will be increased by  $\text{₹} 20$ . Find the number of currencies in each sort.
34. If  $A = \begin{pmatrix} 5 & 2 & 9 \\ 1 & 2 & 8 \end{pmatrix}$ ,  $B = \begin{pmatrix} 1 & 7 \\ 1 & 2 \\ 5 & -1 \end{pmatrix}$  Verify that  $(AB)^T = B^T A^T$ .
35. State and prove angle bisector theorem.
36. A line makes positive intercepts on coordinate axes whose sum is 7 and it passes through  $(-3, 8)$ . Find its equation.
37. If vertices of a quadrilateral are at  $A(-5, 7)$ ,  $B(-4, k)$ ,  $C(-1, -6)$  and  $D(4, 5)$  and its area is 72 sq.units. Find the value of  $k$ .
38. The horizontal distance between two buildings is 140 m. The angle of depression of the top of the first building when seen from the top of the second building is  $30^\circ$ . If the height of the first building is 60 m, find the height of the second building. ( $\sqrt{3} = 1.732$ )

39. Nathan, an engineering student was asked to make a model shaped like a cylinder with two cones attached at its two ends. The diameter of the model is 3 cm and its length is 12 cm. If each cone has a height of 2 cm, find the volume of model that Nathan made.
40. The slant height of a frustum of a cone is 4 m and the perimeter of circular ends are 18 m and 16 m. Find the cost of painting its curved surface area at Rs.100 per sq.m.
41. The rainfall recorded in various places of five districts in a week are given below. Find its standard deviation.

Rain fall (in mm)	45	50	55	60	65	70
Number of places	5	13	4	9	5	4

42. Anand chooses a date at random in April month for a tour program. Find the probability that he chooses
- (i) a Monday                      (ii) a Wednesday                      (iii) a Friday  
(iv) a Saturday or a Sunday

April					
Monday		4	11	18	25
Tuesday		5	12	19	26
Wednesday		6	13	20	27
Thursday		7	14	21	28
Friday	1	8	15	22	29
Saturday	2	9	16	23	30
Sunday	3	10	17	24	.

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

**Note: Answer both questions**

2 x 8 = 16

43. (A) Construct a  $\Delta PQR$  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) Draw the graph of  $y = x^2 + x$  and hence solve  $x^2 + 1 = 0$ . **(OR)**  
b) Draw the graph of  $xy = 24$ ,  $x, y > 0$ . Using the graph find,  
(i)  $y$  when  $x = 3$  and (ii)  $x$  when  $y = 6$ .