



General Instructions

- (i) Q.NO 1 to 6 carry 1 mark each.
- (ii) Q.NO 7 to 12 carry 2 marks each.
- (iii) Q.N 13 to 20 carry 4 marks each.
- (iv) Q.NO 21 to 25 carry 6 marks each.

1. Let  $A = \{x, y, z\}$ ,  $B = \{1, 2\}$ . Find the number of relation from A to B.
  2. The Cartesian product  $A \times A$  has 9 elements among which are found  $(-1, 0)$  and  $(0, 1)$ . Find the Set A and the remaining element of  $A \times A$ .
  3.  $A = \{1, 2, 3, 4, 5, 6\}$ ,  $B = \{2, 4, 6, 8\}$ . Find  $A - B$  and  $B - A$ .
  4. Find the value of  $\sin(-\frac{11\pi}{3})$ .
  5. (i)  $2\sin A \sin B = \dots$  (ii)  $1 - \cos A = \dots$
  6. (i)  $\cos C + \cos D = \dots$  (ii)  $1 + \cos 2A = \dots$
  7. Find the degree measure of the angle subtended at the centre of a circle of radius 100 cm by an arc of the length 22 cm (Use  $\pi = 22/7$ )
  8. Find the domain and range of the real function  $f(x) = \sqrt{x-1}$
  9. Draw the graph of  $f(x) = |x - 1|$ . Find the domain and range of the function.
  10. Solve the inequalities for real x,  $\frac{x}{4} < \frac{(5x-2)}{3} - \frac{(7x-3)}{5}$
  11. If the sum of a certain number of terms of the A.P. 25, 22, 19,..... is 116. Find the last term.
  12. If A.M. and G.M. of two positive numbers a and b are 10 and 8, respectively, find the numbers.
  13. Let S be the sum, P the product and R the sum of reciprocals of n terms in a G.P. Prove that  $P^2 R^n = S^n$
- OR
- If a and b are the roots of  $x^2 - 3x + p = 0$  and c, d are roots of  $x^2 - 12x + q = 0$ , where A, b, c, d form a G.P. prove that  $(q + P) : (q - p) = 17 : 15$ ,
14. (a) Prove that  $\frac{\sin x - \sin 3x}{\sin^2 x - \cos^2 x} = 2\sin x$
  - (b) Prove that  $(\cos x + \cos y)^2 + (\sin x - \sin y)^2 = 4 \cos^2 \frac{x+y}{2}$



15. Prove by using the principle of mathematical induction  
 $1.2 + 2.2^2 + 3.2^3 + \dots + n. 2^n = (n-1) 2^{n+1} + 2$

OR

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

16. If  $\frac{a^n + b^n}{a^{n-1} + b^{n-1}}$  is the A.M. between a and b, then find the value of n.

17. (a) Find the principal and general solutions of the equation,  $\text{Cosec } x = -2$   
 (b) Solve  $2 \cos^2 x + 3 \sin x = 0$

18. Prove that,  $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$

OR

Find the sum to n terms of the series

$$1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 3^2) + \dots$$

19.  $\cos x = -\frac{1}{3}$ , x in quadrant III, find  $\sin \frac{x}{2}$ ,  $\cos \frac{x}{2}$ , and  $\tan \frac{x}{2}$

20. (a) Find all pairs of consecutive even positive integers, both of which are larger than 5 such that their sum is less than 23.

- (b) Is it true that for any sets A and B,  $P(A) \cup P(B) = P(A \cup B)$ ? Justify your answer with example.

21. Show that,  $\frac{1 \times 2^2 + 2 \times 3^2 + \dots + n \times (n+1)^2}{1^2 \times 2 + 2^2 \times 3 + \dots + n^2 \times (n+1)} = \frac{3n+5}{3n+1}$

OR

Find the sum to n terms of the series,  $.6 + .66 + .666 + \dots$

22. Prove that,  $\cos^2 x + \cos^2(x + \frac{\pi}{3}) + \cos^2(x - \frac{\pi}{3}) = \frac{3}{2}$

23. Prove by using the principle of Mathematical Induction,  
 $n(n+1)(n+5)$  is a multiple of 3

OR

Prove by using the principle of mathematical induction,  
 $3^{2n+2} - 8n - 9$  is divisible by 8.

24. (a) Find the domain and range of the function,  $f(x) = \sqrt{9-x^2}$

- (b) Let  $f = \{(1, 1), (2, 3), (0, -1), (-1, -3)\}$  be a function from Z to Z defined by  $f(x) = ax + b$ , for some integers a, b. Determine a, b.

25. (a) In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers. Find the number of people who read at least one of the newspapers.

- (b) Prove that,  $2 \cos \frac{\pi}{13} \cos \frac{9\pi}{13} + \cos \frac{3\pi}{13} + \cos \frac{5\pi}{13} = 0$ .