

**Mathematics PAPER-I**

1. (a) Write the following sets in roster form  $A = \{x/x \text{ is prime number below } 15\}$   
 $B = \{x/x \text{ is a multiple of } 3 \text{ below } 15\}$   $C = \{x/x \text{ is an even number below } 15\}$
- (b) (i) Write  $A \cup B \cup C$  (ii) Find  $A - B$  (iii)  $(A - B) \cap C$  (5)
2. (a) Write the domain of the function  $f(x) = \frac{x^2 + 3x + 5}{x^2 - 5x + 4}$
- (b) Sketch the graph of the function  $f(x) = |x + 1|$  (2+3)
3. (a)  $\cos x - \cos y = \dots\dots\dots$
- (b) Prove that  $(\cos x - \cos y)^2 - (\sin x - \sin y)^2 = 4\sin^2\left(\frac{x-y}{2}\right)$  (1+2)
4. (a) Write general solution of  $\sin x = 0$
- (b) Solve  $\sin x + \sin 3x + \sin 5x = 0$
- (c) Prove that  $2\cos\frac{\pi}{13} \cdot \cos\frac{9\pi}{13} + \cos\frac{3\pi}{13} + \cos\pi\frac{5\pi}{13} = 0$  (1+3+3)
5. Consider the statement  $P(n) : 10^{2n-1} + 1$  is divisible by 11.
- (a) Prove that  $P(1)$  is True.
- (b) Using Mathematical induction prove that the statement is true for all natural numbers (1+3)
6. write conjugate of the complex number  $1 + i\sqrt{3}$
- (b) Convert the Complex number  $\frac{-16}{1+i\sqrt{3}}$  in to  $a + ib$  form .
- (c) write the Polar form of  $a + ib$  obtained in Part (b). (1+2+3)
7. (a) Solve  $\frac{3(x-2)}{5} \leq \frac{5(2-x)}{3}$  (b) Solve Graphically the system of inequalities
- $5x + 4y \leq 40 ; x \geq 2 ; y \geq 3$  . (2+3)
8. (a)  $\frac{n!}{(n-r)!} = \dots\dots\dots$

- (b) Find the rank of the number 443321 among the numbers obtained by using the digits 1, 2, 3, 3, 4, 4 when arranged in ascending order. (4)

OR

- (a) Compute  $nC_5$ , if  $nC_8 = nC_2$   
 (b) A committee of 7 members has to be formed from 9 Boys and 4 Girls. In how many ways this can be done if the committee consists of (i) Exactly 3 Girls (ii) At least 3 Girls (4)

9. Write the General term and middle term of the Expansion  $(\frac{3}{2}x^2 - \frac{1}{3x})^6$  (3)

OR

Evaluate  $\sum_{r=0}^n nCr 4^r$  using binomial theorem.

10. If the 4<sup>th</sup>, 10<sup>th</sup>, 16<sup>th</sup> term of a G.P are x, y, z then Prove that x, y, z are also in G.P. Also Prove That  $y^{20} = (xz)^{10}$ . (2 + 1)

- (b) Insert 6 numbers between 3 and 24 so that the resulting sequence is an A.P. (2).

11. Match the following (5)

	A - Conditions for a Line	B -Equation of the line
1.	Passing through the point( 3, 2)and (-1,4)	( a ) $3x + 2y = 6$
2.	X – intercept is 2, Y- intercept - 3	( b ) $X = 3$
3.	Y – intercept 1 , Slope = 3/2	( c ) $3x - 2y + 2 = 0$
4.	Slope = 3/2 , and passing through Origin	( d ) $Y = 3$
5.	Passing through (0,3) and parallel to X-axis	( e ) $3x - 2y = 0$

12. (a) Find the center and radius of the circle  $2x^2 + 2y^2 - x = 0$

- (b) Find the vertex, foci, and eccentricity of the ellipse  $16x^2 + y^2 = 1$  (2 + 3)

13. (a) Write any point in the octant X'OYZ.

- (b) Find the ratio in which YZ- plane divides the line joining the points ( 4, 8, 10 ) and ( 6, 10, -8) ( 1 + 3)

14. Choose the correct answer from the given options.

- (a)  $\lim_{x \rightarrow 0} \frac{\sin ax}{bx} = \dots\dots\dots$  (i)  $\frac{a}{b}$  (ii)  $\frac{b}{a}$  (iii)  $\frac{-a}{b}$  (iv)  $\frac{-b}{a}$  (v) None of these

- (b) If  $f(x) = x^2 - 1, x \leq 1$

- $-x^2 - 1, x > 1$  find  $\lim_{x \rightarrow 1} f(x)$  ( 1 + 3)

**OR**

(a)  $\lim_{x \rightarrow 0} \frac{\tan x}{x} = \text{-----}$

- (i) 0      (ii) Not defined      (iii) x      (iv) Tan x      (v) None of these

(b) Evaluate  $\lim_{x \rightarrow 0} \frac{\sqrt{x+1} - 1}{x}$  ( 1+ 3)

15. Find the derivative of Tan x , using first principles (4)

**OR**

Differentiate  $\frac{\sin x \cos x}{x}$

16. (a) Given p : " A Square is a quadrilateral ". Write negation of p.

(b) Consider s : " If a number is divisible by 10 it is divisible by 5 " .

(i) Write Converse of s (ii) Contra positive of s . ( 3)

17.

Xi	3	8	13	18	23
fi	7	10	15	10	6

(a) Find Mean deviation about Mean

(b) Compute Variance(x) and S.D.

(c) Compute coefficient of variation . ( 5)

18. In a class of 60 students , 30 opted for NCC , 32 opted for NSS , and 24 opted for both NCC and NSS . If

one of these students is selected at random , find the Probability that

(a) The student opted for NCC or NSS .

(b) The student has opted neither NCC nor NSS .

(c) The student has opted NSS but not NCC . ( 3)

