

**Paper – Mathematics  
Class - XI**

Time : 3 hrs.

M. M. 100

**SECTION – A**

**QUESTION NUMBER 1 TO 6 CARRY 1 MARK EACH.**

- Write the equation of the straight line passing through the point (5, 6) and has intercept on the axes equal in magnitude and both positive.
- 20 cards are numbered 1 to 20. One card is then drawn at random. Write the probability that the number of the card be divisible by 5.
- Evaluate :  $\sin(40^\circ + \theta) \cos(50^\circ - \theta) + \cos(40^\circ + \theta) \sin(50^\circ - \theta)$ .
- Let  $A = \{1, 2, 3, 4, 5, 6\}$ . Define a relation  $R$  from  $A$  to  $A$  by  $R = \{(x, y) : y = 2x + 5\}$ .
- The function 't' which maps temperature in degree Celsius into temperature in degree Fahrenheit is defined by  $t(C) = \frac{9C}{5} + 32$ . Find the value of  $C$ , when  $t(C) = 212$ .
- How many six-digit telephone number can be formed using the digits 0 to 9, if each number starts with 98 and no digit is repeated?

**SECTION – B**

**QUESTION NUMBER 7 TO 19 CARRY 4 MARKS EACH.**

- Solve :  $\sin 2x - \sin 4x + \sin 6x = 0$ .
- Prove by using the principle of mathematical induction for all  $n \in N$

$$1.2 + 2.3 + 3.4 + \dots + n.(n + 1) = \left[ \frac{n(n + 1)(n + 2)}{3} \right]$$

- Find the ratio in which the line  $3x + 4y + 2 = 0$  divides the line segment joining the points (1, -2, 3) and (3, 4, -5).

**OR**

If  $p$  is the length of perpendicular from the origin to the line which make intercepts  $a, b$  on axes prove that  $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$ .

- Three coins are tossed once. Find the probability of getting  
(i) 3 heads (ii) at least 2 heads (iii) exactly two tails.
- In how many ways can the letters of the word "INTERMEDIATE" be arranged so that :  
(i) the vowels always occupy even places? (ii) the relative order of vowels and consonants do not alter?

**OR**

The sum of two numbers is 6 times their geometric means show that numbers are in the ratio  $(3 + 2\sqrt{2}) : (3 - 2\sqrt{2})$ .

- Prove that :  $\sin 3x + \sin 2x - \sin x = 4 \sin x \cos \frac{x}{2} \cos \frac{3x}{2}$ .
- Solve :  $2 \sin^2 x + \sin^2 2x = 2$ .
- Show that :  $\sin^4 \frac{\pi}{8} + \sin^4 \frac{3\pi}{8} + \sin^2 \frac{5\pi}{8} + \sin^2 \frac{7\pi}{8} = \frac{3}{2}$ .
- In a function, 100 officers were awarded medals for efficiency, 70 for honesty, 46 for hardwork, 30 for efficiency as well as honesty, 28 for efficiency and hardwork, 23 for honesty and hardwork and 18 for all three qualities. If there are 200 officers, how many missed the medals?
- Find the equation of the parabola that satisfies the given conditions : Vertex (0, 0), focus (3, 0).
- (i) Let  $A = \{1, 2, 3, \dots, 18\}$ . Define a relation  $R$  from  $A$  to  $A$  by  $R = \{(x, y) : 3x - y = 0, \text{ where } x, y \in A\}$ . Write down its domain and range.  
(ii) Let  $A = \{p, q\}$  and  $B = \{r, s\}$ . Find the number of relations from  $A$  to  $B$ .
- Find the eccentricity, foci and the length of the latus rectum of the ellipse :  $x^2 + 4y^2 + 8y - 2x + 1 = 0$ .
- Show that the ratio of the sum of first  $n$  terms of a G.P. to the sum of terms from  $(n + 1)$ th to  $(2n)$ th term is  $\frac{1}{r^n}$ .

**OR**

Prove that :  $\tan 2\theta (\sec 8\theta - 1) = \tan 8\theta (\sec 4\theta - 1)$

**SECTION C**

**QUESTION NUMBER 20 TO 26 CARRY 6 MARKS EACH.**

- The mean and variance of eight observations are 9 and 9.25, respectively. If six of the observations are 6, 7, 10, 12, 12 and 13, find the remaining two observations.
- (i) Solve the inequality and represents the solution graphically on number line :  $5x + 1 > -24, 5x - 1 < 24$ .

- (ii) Solve the system of inequality graphically :  $4x + 3y \leq 60, y \geq 2x, x \geq y, x, y \geq 0$
22. (i) Evaluate :  $\lim_{x \rightarrow 0} \frac{\sqrt{1+x}-1}{x}$
- (ii) Find the derivative of  $f(x) = x \sin x$  from the first principle.
23. (i) In an A.P. the first term is 2 and the sum of the first five terms is one-fourth of the next five terms. Show that 20<sup>th</sup> term is -112.
- (ii) The sum of an infinite G.P. is 57 and the sum of squares of these terms is 45. Find the series .
24. Prove that :
- (i)  $\cos^2 x + \cos^2(x + 120^\circ) + \cos^2 x(x - 120^\circ) = \frac{3}{2}$ .      (ii)  $\sin 10^\circ \sin 50^\circ \sin 60^\circ \sin 70^\circ = \frac{\sqrt{3}}{16}$ .
- (iii)  $\sec(45^\circ + x) \sec(45^\circ - x) - 2 \sec 2x$ .
25. (i) Evaluate :  $\lim_{x \rightarrow 0} \frac{x \sin 5x}{\sin^2 3x}$ .
- (ii) Evaluate :  $\lim_{x \rightarrow 2} \frac{x^n - 2^n}{x - 2} = 80$  and if  $n$  is a positive integer, find all possible values of  $n$ .
26. Find the sum of the series upto  $n$  terms :  $\frac{1^3}{1} + \frac{1^3+2^3}{1+3} + \frac{1^3+2^3+3^3}{1+3+5} + \dots$