CLASS : XI A/B/C
SUBJECT : MATHEMATICS

M:M : 100
TIME: 3 Hrs

SECTION – A

I. Each question carries 1 mark. (1 x 4 = 4)

1. If $A = \{3, 4, 5\}$, then write the power set of A.

2. Evaluate $\sin\left(\frac{-11\pi}{3}\right)$

3. If $\alpha + \beta = 90^\circ$, find the maximum and minimum values of $\sin\alpha \sin\beta$.

4. Write the solution set of $\frac{x+3}{x-2} \le 2$

5. Find the equation of the circle, the coordinates of the end points of whose diameter are (-1 , 2) and (4, -3).

6. Two vertices of a triangle are (3 , -5) and (-7 , 4). If its centroid is (2, -1), find the third vertex.

7. Two sides of a square lie on the lines $x + y = 1$ and $x + y + 2 = 0$. What is its area?

8. Differentiate $2^x \cot x$.

9. There are 4 letters and 4 addressed envelopes. Find the probability that all the letters are not dispatched in right envelopes.

10. Find the median of the data: 4 , 6, 9 , 4 , 2 , 8 , 10.

SECTION – B

II. Each question carries 4 mark. (4 x 12 = 48)

11. If $A = \{1,2,3\}, B = \{3,4\}$ and $C = \{4,5,6\}$ find
(i) $A \times (B \cap C)$ (ii) $(A \times B) \cap (A \times C)$ (iii) write your observation.

12. Find the domain and range of the function $f(x) = \frac{3}{2 - x^2}$.

OR

In a survey of 700 students in a college, 180 were listed as drinking Limca, 275 as drinking Miranda and 95 were listed as both drinking Limca as well as Miranda. Find how many students were drinking neither Limca nor Miranda.

13. Evaluate $x^4 + 4x^3 + 6x^2 + 4x + 9$ when $x = -1 + i\sqrt{2}$.

14. If ${}^9P_5 + 5\,{}^9P_4 = {}^{10}P_r$, find r.

15. Divide 32 into four parts which are in A.P such that product of extremes is to the product of means is 7:15.

16. Find the image of the point (2,1) w.r.t the line mirror $x + y - 5 = 0$

OR

Find the equations of the st.lines through (3,2) which make acute angle of 45° with the line $x - 2y - 3 = 0$

17. Differentiate $\sqrt{\cos x}$ w.r.t to x form first principles.

18. Evaluate $\lim_{x \to \frac{\pi}{4}} \frac{\tan^3 x - \tan x}{\cos\left(x + \frac{\pi}{4}\right)}$ OR Evaluate $\lim_{x \to \frac{\pi}{4}} \frac{4\sqrt{2} - (\cos x + \sin x)^5}{1 - \sin 2x}$

19. Three coins are tossed once. Find the probability of getting (i) no heads (ii) at most two heads (iii) exactly one tail (iv) all heads.

20. Solve $\cot^2\theta + \frac{3}{\sin\theta} + 3 = 0$ OR Solve $2\tan\theta - \cot\theta = -1$

21. If $\sin\theta = n\sin(\theta + 2\alpha)$, prove that $\tan(\theta + \alpha) = \frac{1+n}{1-n}\tan\alpha$.

OR

$\left(1+\cos\frac{\pi}{8}\right)\left(1+\cos\frac{3\pi}{8}\right)\left(1+\cos\frac{5\pi}{8}\right)\left(1+\cos\frac{7\pi}{8}\right) = \frac{1}{8}$.

22. Prove that $16\cos\frac{2\pi}{15}\cos\frac{4\pi}{15}\cos\frac{8\pi}{15}\cos\frac{14\pi}{15} = 1$.

SECTION – C

II. Each question carries 6 mark. (6 x 7 = 48)

23. By using principle of mathematical induction prove that

$$\frac{1}{1.2.3} + \frac{1}{2.3.4} + \frac{1}{3.4.5} + \dots\dots + \frac{1}{n(n+1)(n+2)} = \frac{n(n+3)}{4(n+1)(n+2)}, \forall n \in N.,$$

OR

Prove that $2.7^n + 3.5^n - 5$ is divisible by 24, $\forall n \in N$ by using principle of mathematical induction.

24. Solve $x^2 - (7-i)x + (18-i) = 0$.

25 (a) Find the middle term in the expansion of $\left(\frac{2}{3}x - \frac{3}{2x}\right)^{20}$.

(b) Find the 4th term form the end in the expansion of $\left(\frac{4x}{5} - \frac{5}{2x}\right)^9$.

26. Find the sum to n terms of the series $\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \dots\dots\dots$

OR

Find the sum of first n terms of the following series $3 + 7 + 13 + 21 + 31 + \dots\dots$

27: Show that points $(9,1), (7,9), (-2,12)$ and (6, 10) are concylic

OR

Find the centre, the lengths of the axes, vertices, directrices, foci of the following ellipse $4x^2 + y^2 - 8x + 2y + 1 = 0$

28. Prove that $\sin 6° \sin 42° \sin 66° \sin 78° = \frac{1}{16}$.

29. Find the mean deviation from the mean of the following distribution.

Marks	0-10	10-20	20-30	30-40	40-50
No of students	5	8	15	16	6