S–5–C

Roll No. .....

Total No. of Questions : **29**] [*Total No. of Printed Pages* : **7**

XIAPBASZJD22

7705–C

MATHEMATICS

Time : 3 Hours] **[Maximum Marks : 100**

(Objective Type Questions) 1 each

1. A function f is defined by $f(x) = 2x - 5$. The value of $f(-3) = -11$.

(True/False)

2. Let A = {1, 2} and B = {3, 4}, then B × A = ...

(Fill in the blank)

3. The derivative of sin x at $x = 0$ is 0. (True/False)

4. The derivative of $\frac{x-a}{x-b}$ = ... (Fill in the blank)

(Very Short Answer Type Questions) 2 each

5. If U = {1, 2, 3, 4, 5, 6, 7, 8, 9}, A = {1, 2, 3, 4}, B = {2, 4, 6, 8}, find $(A \cup B)'$.

6. Find the multiplicative inverse of $\sqrt{5}+3i$.

7. Find the limit :

$$\lim_{x \to \frac{\pi}{2}} \frac{\tan 2x}{x - \frac{\pi}{2}}$$

8. Find the derivative of :

$$5 \sin x - 6 \cos x + 7$$

9. Find the slope of the line passing through the points (3, –2) and (3, 4).

10. A coin is tossed three times. Find the probability of at least 2 tails.

11. Using binomial theorem evaluate $(101)^4$.

12. If $a_n = \frac{2n-3}{6}$, find the first five terms.

(Short Answer Type Questions) 4 each

13. In a group of 65 people, 40 like Cricket, 10 like both Cricket and Tennis. How many like Tennis only and not Cricket ? How many like Tennis ?

14. Write the relation R = $\{(x, x^3) : x$ is a prime number less than 10$\}$ in roster form.

15. Prove by using the principle of mathematical induction $\forall\ n \in N$:

$$1^2 + 2^2 + 3^2 + \ldots\ldots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

16. Find the coordinates of focus, axis of parabola, the equation of directrix and the length of latus rectum of $y^2 = -8x$.

17. Convert the complex number $\sqrt{3} + i$ in the polar form.

18. Find the derivative of cos x from first principle.

Or

Find the derivative of the function :

$$\frac{\sin x + \cos x}{\sin x - \cos x}$$

19. If three points $(h, 0)$, (a, b) and $(0, k)$ lie on a line, show that :

$$\frac{a}{h}+\frac{b}{k}=1$$

20. A letter is chosen at random from the word 'ASSASSINATION'. Find the probability that letter is :

(i) a vowel

(ii) a consonant

21. The coefficients of $(r-1)$th, rth and $(r+1)$th terms in the expansion of $(x+1)^n$ are in the ratio 1 : 3 : 5. Find n and r.

22. Using section formula, show that the points A(2, –3, 4), B(–1, 2, 1) and $C\left(0, \frac{1}{3}, 2\right)$ are collinear.

23. Find the negation of the statements :

(i) $\sqrt{2}$ is not a complex number.

(ii) All triangles are not equilateral triangles.

(Long Answer Type Questions) 6 each

24. Find the general solution of the equation :

$$\sin x + \sin 3x + \sin 5x = 0$$

Or

Prove that :

$$\cot x \cot 2x - \cot 2x \cot 3x - \cot 3x \cot x = 1$$

25. Determine n if :

(i) ${}^{2n}C_3 : {}^{n}C_3 = 12 : 1$

(ii) ${}^{2n}C_3 : {}^{n}C_2 = 11 : 1$

Or

In how many of the distinct permutations of the letters in MISSISSIPPI do the 4 I's not come together ?

26. Prove that :

$$\frac{\cos 4x + \cos 3x + \cos 2x}{\sin 4x + \sin 3x + \sin 2x} = \cot 3x$$

27. Find the equation of ellipse that satisfies the conditions :

Major axis on x-axis and passes through the points (4, 3) and (6, 2).

28. Find the mean, variance and standard deviation using short-cut method :

Height (in cm)	No. of Children
70—75	3
75—80	4
80—85	7
85—90	7
90—95	15
95—100	9
100—105	6
105—110	6
110—115	3

29. Insert five numbers between 8 and 26 such that resulting sequence is an A.P.

Or

Sum of the first p, q and r terms of an A.P. are a, b and c respectively. Prove that :

$$\frac{a}{p}(q-r)+\frac{b}{q}(r-p)+\frac{c}{r}(p-q)=0$$