S–5–A

Roll No. .....

Total No. of Questions : **29**]

[*Total No. of Printed Pages* : **7**

XIAPBASZJD22
7705–A
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 $f(0) = -5$.

(True/False)

2. If G = {7, 8} and H = {5, 4, 2}, then G × H = ...

(Fill in the blank)

3. $\lim_{x \to a} \frac{x^n - a^n}{x - a} = na^{n-2}$. (True/False)

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

(Very Short Answer Type Questions) 2 each

5. If U = {*a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*}, find the complements of the sets A = {*a*, *b*, *c*}, B = {*d*, *e*, *f*, *g*}.

6. Find the modulus and argument of $Z = -1 - i\sqrt{3}$.

7. Find the limit :

$$\lim_{x \to 3} \frac{x^4 - 81}{2x^2 - 5x - 3}$$

8. Find the derivative of :

3 cot x + 5 cosec x

9. Find the slope of the line passing through the points (3, –2) and (–1, 4).

10. A die is thrown repeatedly until a six comes up. What is the sample space ?

11. Using binomial theorem evaluate $(96)^3$.

12. If $a_n = n \cdot \frac{n^2 + 5}{4}$, find first five terms.

(Short Answer Type Questions) 4 each

13. If X and Y are two sets such that X has 40 elements, X ∪ Y has 60 elements and X ∩ Y has 10 elements, how many elements does Y have ?

14. Find the domain and range of real function $f(x) = -|x|$.

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

$$1^3 + 2^2 + 3^3 + \ldots\ldots + n^3 = \left[\frac{n(n+1)}{2}\right]^2$$

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 :

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