

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 $G \times H = \dots\dots\dots$

(Fill in the blank)

3. $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = na^{n-2}$.

(True/False)

4. The derivative of $(x - a)(x - b) = \dots\dots\dots$

(Fill in the blank)

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Turn Over

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(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 :

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

8. Find the derivative of :

$$3 \cot x + 5 \operatorname{cosec} x$$

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, $X \cup Y$ has 60 elements and $X \cap Y$ 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 $n \in \mathbb{N}$:

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

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, r th 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. <https://www.jkbosenonline.com>

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) ${}^{2n}C_3 : {}^nC_3 = 12 : 1$

(ii) ${}^{2n}C_3 : {}^nC_2 = 11 : 1$

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 :

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

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