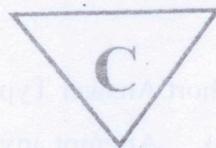


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TS



Total No. of Questions – 24

Total No. of Printed Pages – 3

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No.

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Part - III

MATHEMATICS, Paper – II(A)

(English Version)

Time : 3 Hours]

[Max. Marks : 75

Note : This question paper consists of **three** Sections – A, B and C.

SECTION – A

10 × 2 = 20

I. Very Short Answer Type Questions :

- (i) Answer **all** questions.
- (ii) Each question carries **two** marks.

1. If  $Z = (\cos \theta, \sin \theta)$ , then find  $\left(Z - \frac{1}{Z}\right)$
2. If  $Z = x + iy$  and  $|Z| = 1$ , then find the locus of  $Z$ .
3. If 1,  $w$ ,  $w^2$  are the cube roots of unity, then find the value of  $(1 - w + w^2)^3$ .
4. Find the set of solutions of  $x^2 + x - 12 \leq 0$  by algebraic method.
5. If  $\alpha, \beta, \gamma$  are the roots of  $4x^3 - 6x^2 + 7x + 3 = 0$ , then find the value of  $\alpha\beta + \beta\gamma + \gamma\alpha$ .
6. Find the number of ways of preparing a chain with 6 different coloured beads.
7. If  $nC_4 = 210$ , then find  $n$ .
8. Find the number of terms in the expansion of  $(2x + 3y + z)^7$ .
9. Find the variance of the following data :  
5, 12, 3, 18, 6, 8, 2, 10
10. The mean and variance of a binomial distribution are 4 and 3 respectively. Fix the distribution and find  $P(x \geq 1)$ .

## SECTION - B

5 × 4 = 20

## II. Short Answer Type Questions :

- (i) Attempt any **five** questions.  
 (ii) Each question carries **four** marks.

11. If  $x + iy = \frac{1}{1 + \cos \theta + i \sin \theta}$ , then show that  $4x^2 - 1 = 0$ .

12. If  $c^2 \neq ab$  and the roots of the equation  $(c^2 - ab)x^2 - 2(a^2 - bc)x + (b^2 - ac) = 0$  are equal, then show that  $a^3 + b^3 + c^3 = 3abc$  or  $a = 0$ .

13. If the letters of the word MASTER are permuted in all possible ways and the words thus formed are arranged in the dictionary order, then find the rank of the word MASTER.

14. Prove that  $\frac{{}^{4n}C_{2n}}{{}^{2n}C_n} = \frac{1 \cdot 3 \cdot 5 \cdots (4n-1)}{\{1 \cdot 3 \cdot 5 \cdots (2n-1)\}^2}$

15. Resolve  $\frac{x^3}{(x-a)(x-b)(x-c)}$  into partial fractions.

16. The probability for a contractor to get a road contract is  $\frac{2}{3}$  and to get a building contract is  $\frac{5}{9}$ . The probability to get atleast one contract is  $\frac{4}{5}$ . Find the probability that he gets both the contracts.

17. A speaks truth in 75% of the cases and B in 80% cases. What is the probability that their statements about an incident do not match ?

## SECTION - C

5 × 7 = 35

## III. Long Answer Type Questions :

- (i) Attempt any **five** questions.  
 (ii) Each question carries **seven** marks.

18. If  $n$  is an integer and  $Z = \text{cis } \theta$ ,  $\left(\theta \neq (2n+1)\frac{\pi}{2}\right)$  then show that  $\frac{Z^{2n}-1}{Z^{2n}+1} = i \tan n\theta$ .

19. Solve the equation  $x^4 + x^3 - 16x^2 - 4x + 48 = 0$ , given that the product of two of the roots is 6.

20. If 36, 84, 126 are three successive binomial co-efficients in the expansion of  $(1+x)^n$ , then find n.

21. If  $x = \frac{1}{5} + \frac{1.3}{5.10} + \frac{4.3.5}{5.10.15} + \dots \infty$ , then find  $3x^2 + 6x$ .

22. Find the mean deviation about the mean for the following data :

$x_i$	2	5	7	8	10	35
$f_i$	6	8	10	6	8	2

23. Three boxes numbered I, II, III contain the balls as follows :

	White	Black	Red
I	1	2	3
II	2	1	1
III	4	5	3

One box is randomly selected and a ball is drawn from it. If the ball is red, then find the probability that it is from Box-II.

24. A cubical die is thrown. Find the mean and variance of X, giving the number on the face that shows up.