

266

II

Total No. of Questions : 24  
Total No. of Printed Pages : 4

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## Part-III

## MATHEMATICS, Paper - II(A)

(English version)

Time : 3 Hours]

[Max. Marks : 75

**Note :** This question paper contains **three** sections **A, B** and **C**.

SECTION - A

10×2=20

**I.** Very short answer type questions.

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

- Write the conjugate of complex number  $\frac{5i}{7+i}$
- Express  $1-i$  in modulus - amplitude form.
- If  $A, B, C$  are angles of a triangle such that  $x = \text{cis } A, y = \text{cis } B, z = \text{cis } C$ , then find the value of  $xyz$ .
- For what values of  $x$ , the expression  $15 + 4x - 3x^2$  is negative?
- Find the transformed equation whose roots are the negatives of the roots of  $x^4 + 5x^3 + 11x + 3 = 0$ .

6. Find the number of 4 letter words that can be formed using the letters of the word PISTON, in which atleast one letter is repeated.
7. If  $10 \cdot {}^nC_2 = 3 \cdot {}^{(n+1)}C_3$ , find  $n$ .
8. Prove that  $C_0 + 2 \cdot C_1 + 4 \cdot C_2 + 8 \cdot C_3 + \dots + 2^n \cdot C_n = 3^n$ .
9. Find the variance for an ungrouped data 5, 12, 3, 18, 6, 8, 2, 10.
10. The probability that a person chosen at random is left handed (in hand writing) is 0.1. What is the probability that in a group of 10 people, there is one who is left handed?

### SECTION-B

5×4=20

#### II. Short answer type questions.

- (i) Answer **ANY FIVE** questions.
- (ii) Each question carries **four** marks.

11. Show that the points in the Argand plane represented by the complex numbers  $-2 + 7i$ ,  $-\frac{3}{2} + \frac{1}{2}i$ ,  $4 - 3i$ ,  $\frac{7}{2}(1+i)$  are the vertices of a Rhombus.

12. If  $x$  is real, prove that  $\frac{1}{3x+1} + \frac{1}{x+1} - \frac{1}{(3x+1)(x+1)}$  does not lie between 1 and 4.

13. If the letters of the word MASTER are permuted in all possible ways and the words thus formed are arranged in 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  $\frac{2x^2 + 3x + 4}{(x-1)(x^2+2)}$  into partial fractions.

16. If A, B, C are three events, then show that

$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(C \cap A) + P(A \cap B \cap C)$$

17. A problem in calculus is given to two students A and B, whose chances of solving it are  $\frac{1}{3}$  and  $\frac{1}{4}$  respectively. Find the probability of the problem being solved, if both of them try independently.

### 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, show that  $(1+i)^n + (1-i)^n = 2^{\frac{n+2}{2}} \cos\left(\frac{n\pi}{4}\right)$ .

19. Solve  $x^4 - 4x^2 + 8x + 35 = 0$ , given that  $2+i\sqrt{3}$  is a root.

20. If the coefficients of  $r^{th}$ ,  $(r+1)^{th}$  and  $(r+2)^{nd}$  terms in the expansion of  $(1+x)^n$  are in A.P., then show that  $n^2 - (4r+1)n + 4r^2 - 2 = 0$ .

21. If  $x = \frac{1 \cdot 3}{3 \cdot 6} + \frac{1 \cdot 3 \cdot 5}{3 \cdot 6 \cdot 9} + \frac{1 \cdot 3 \cdot 5 \cdot 7}{3 \cdot 6 \cdot 9 \cdot 12} + \dots$ ,

then prove that  $9x^2 + 24x = 11$ .

22. Find the mean deviation from the mean for the following continuous frequency distribution.

Sales in Rs. thousand	40-50	50-60	60-70	70-80	80-90	90-100
Number of Companies	5	15	25	30	20	5

23. State and prove Baye's theorem.

24. The range of a random variable  $X$  is  $\{0, 1, 2\}$ .

Given that  $P(X = 0) = 3C^3$ ,  $P(X = 1) = 4C - 10C^2$ ,  $P(X = 2) = 5C - 1$

(i) Find the value of  $C$ .

(ii)  $P(X < 1)$

(iii)  $P(1 < X \leq 2)$  and  $P(0 < X \leq 3)$

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