$\mathbf{B}$ 

Total No. of Questions - 24

Total No. of Printed Pages - 4

Regd. No.

## Part - III MATHEMATICS, Paper - II (A) (Algebra and Probability) (English Version)

Time: 3 Hours

Max. Marks: 75

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

## SECTION A

 $10 \times 2 = 20$ 

- I. Very Short Answer Type Questions.
  - i) Answer all questions.
  - ii) Each question carries two marks.
  - 1. Write the complex number (2-3i)(3+4i) in the form A+iB.
  - 2. Express the complex number  $-1-i\sqrt{3}$  in modulus amplitude form.
  - 3. Find the value of  $(1-i)^8$ .
  - 4. Find the maximum of the expression  $2x + 5 3x^2$  as x varies over R.
  - 5. If 1, 1,  $\alpha$  are the roots of  $x^3 6x^2 + 9x 4 = 0$ , then find  $\alpha$ .
  - **6.** If  ${}^{n}C_{5} = {}^{n}C_{6}$ , then find  ${}^{13}C_{n}$ .

- 7. Find the number of ways of arranging the letters of the word MATHEMATICS.
- 8. Find the coefficient of  $x^{11}$  in  $\left(2x^2 + \frac{3}{x^3}\right)^{13}$ .
- 9. Find the mean deviation about the median for the data: 4, 6, 9, 3, 10, 13, 2.
- 10. For a binomial distribution with mean 6 and variance 2, find the first two terms of the distribution.

## SECTION B

5

- II. Short Answer Type Questions.
  - Attempt any five questions.
  - Each question carries four marks.
  - 11. If  $Z = 2 i\sqrt{7}$  then, show that  $3z^3 4z^2 + z + 88 = 0$ .
  - 12. If  $x \in R$  then determine the range of the expression  $\frac{x^2 + x + 1}{x^2 x + 1}$ .
- 13 A round table conference is attended by 3 Indians, 3 Chinese, 3 Canadians and 2 Americans. Find the number of ways of arranging them at the round table so that the delegates belonging to same country sit together.
- <sup>14</sup>Find the number of ways of selecting a cricket team of 11 players from 7 batsmen and 6 bowlers. Such that there will be atleast 5 bowlers in the team.

- 15. Resolve  $\frac{3x-1}{(1-x+x^2)(x+2)}$  into partial fraction.
- 16. 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.
- 17. A bag contains 12 two rupee coins, 7 one rupee coins and 4 half a rupee coins. If three coins are selected at random, then find the probability that:
  - i) The sum of three coins is maximum
  - ii) The sum of three coins is minimum
  - iii) Each coin is of different value

## SECTION C

 $5 \times 7$ 

Long Answer Type Questions.

- i) Attempt any five questions.
- ii) Each question carries seven marks.
- 18. Show that one value of  $\left[\frac{1+Sin\frac{\pi}{8}+iCos\frac{\pi}{8}}{1+Sin\frac{\pi}{8}-iCos\frac{\pi}{8}}\right]^{\frac{8}{3}}$  is -1.
- Solve  $18x^3 + 81x^2 + 121x + 60 = 0$  given that one root is equal to half the sum of the remaining roots.
- If n is a positive integer and x is any non-zero real number, then

prove that 
$$c_0 + c_1 \frac{x}{2} + c_2 \cdot \frac{x^2}{3} + c_3 \cdot \frac{x^3}{4} + \dots + c_n \cdot \frac{x^n}{n+1} = \frac{(1+x)^{n+1}-1}{(n+1)x}$$

21. If  $t = \frac{4}{5} + \frac{4.6}{5.10} + \frac{4.6.8}{5.10.15} + \dots \infty$ , then prove that 9t = 16.

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. A, B, C are 3 newspapers from a city 20% of the population read A, 16% read B, 14% read C, 8% both A and B, 5% both A and C, 4% both B and C and 2% all the three. Find the percentage of the population who read atleast one newspaper.

24. A random variable X has the following probability distribution:

X = x	0	1	2	3	4	5	6	7
$P\left( X=x\right)$	0	k	2k	2k	3k	$k^2$	$2k^2$	$7k^2+k$

Find (i) k (ii) the mean and (iii) P(0 < X < 5).