

Total No. of Questions - 24

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Total No. of Printed Pages - 4

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

I. Very short answer type questions.

10 × 2 = 20

i) Answer all questions.

ii) Each question carries two marks.

1. Find the maximum or minimum value of the quadratic expression  $2x - 7 - 5x^2$ .

2. If  $-1, 2$  and  $\alpha$  are the roots of the equation  $2x^3 + x^2 - 7x - 6 = 0$ , then find  $\alpha$ .

3. If  $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \end{bmatrix}$  and  $B = \begin{bmatrix} 3 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$ , find  $3B - 2A$ .

4. If  $A = \begin{vmatrix} 1 & 2 & 1 \\ -1 & 0 & 2 \\ 0 & 1 & -1 \end{vmatrix}$ , find the rank (A).

5. Find the number of ways of arranging the letters of the word, "CORRUPTION".

6. If  ${}^{n-1}P_5 : {}^nP_5 = 3 : 2$ , find  $n$ .
7. Find the middle term in the expansion of  $\left(\frac{3x}{7} - 2y\right)^{10}$ .
8. Write the coefficient of  $x^n$  in the expansion  $e^{a-bx}$ .
9. Find the probability that a non-leap year contains 53 Sundays.
10. If  $X$  is a Poisson's variate such that  $P(X=1) = 3P(X=2)$ , then find the variance of  $X$ .

### SECTION B

5 × 4 = 20

#### II. Short answer type questions.

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

11. Show that the values of the function  $\frac{x^2 + 34x - 71}{x^2 + 2x - 7}$  do not lie between 5 and 9 for all  $x \in R$ .

12. If  $A = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 2 & 3 \\ 1 & 1 & 2 \end{bmatrix}$ , then find  $A^{-1}$ .

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

14. Simplify  ${}^{34}C_5 + \sum_{r=0}^4 ({}^{38-r}C_4)$ .

15. Resolve  $\frac{x^2 - 3}{(x+2)(x^2+1)}$  into partial fractions.

16. Find the coefficient of  $x^n$  in the series expansion of  $\left(1 - \frac{x}{2!} + \frac{x^2}{4!} - \dots\right)$  when  $n$  is odd and when  $n$  is even.

17. Let  $A$  and  $B$  be independent events with  $P(A) = 0.2$ ,  $P(B) = 0.5$ . Then find:

- i)  $P(A/B)$
- ii)  $P(B/A)$
- iii)  $P(A \cap B)$
- iv)  $P(A \cup B)$

**SECTION C**

III. Long answer type questions.

**5 × 7 = 35**

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

18. Solve the equation  $x^4 - 10x^3 + 26x^2 - 10x + 1 = 0$ .

19. Show that:

$$\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}^2 = \begin{vmatrix} 2bc - a^2 & c^2 & b^2 \\ c^2 & 2ac - b^2 & a^2 \\ b^2 & a^2 & 2ab - c^2 \end{vmatrix} = (a^3 + b^3 + c^3 - 3abc)^2$$

20. Solve the following equations by using Cramer's rule:

$$3x + 4y + 5z = 18$$

$$2x - y + 8z = 13$$

$$5x - 2y + 7z = 20$$