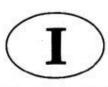
266



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

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

 $10 \times 2 = 20$

- Very short answer type questions.
 - (i) Answer all the questions.
 - (ii) Each question carries two marks.
 - 1. If the equation $x^2 15 m(2x 8) = 0$ has equal roots, find the value of 'm'.
 - 2. If $-1, 2, \alpha$ are the roots of the equation $2x^3 + x^2 7x 6 = 0$, then find ' α '.
 - 3. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 3 & 4 \\ 5 & -6 & x \end{bmatrix}$ and det A = 45; then find 'x'.
 - 4. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$; $B = \begin{bmatrix} 3 & 8 \\ 7 & 2 \end{bmatrix}$ and 2X + A = B, then find 'X'.

- 5. Find the number of ways of arranging the letters of the word "ENGINEERING".
- If ${}^{n}C_{5} = {}^{n}C_{6}$ then find ${}^{13}C_{n}$ 6.
- Find the number of terms in the expansion of $(2x+3y+z)^7$. 7.
- If $f(x) = 1 + \frac{x^2}{2!} + \frac{x^4}{4!} + \frac{x^6}{6!} + \dots \infty$, then show that $f'(x) = \sinh x$.
- If A, B are two events with $P(A \cup B) = 0.65$. $P(A \cap B) = 0.15$, 9. then find the value of $P(A^c) + P(B^c)$.
- If X is a Poisson variate with P(X=0) = P(X=1) = k, then show that $k = e^{-1}$.

SECTION-B

 $5 \times 4 = 20^{\circ}$

- Short answer type questions. П.
 - Answer ANY FIVE questions. (i)
 - Each question carries Four marks.
 - 11. If x is real, prove that $\frac{x}{x^2-5x+9}$ lies between $-\frac{1}{11}$ and 1.
 - 2. If $A = \begin{bmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_1 & b_2 & c_2 \end{bmatrix}$ is a non-singular matrix, then show that A is

invertible and $A^{-1} = \frac{Adj A}{dot A}$.

Find the sum of all 4 digit numbers that can be formed using the digits 1, 3, 5, 7 and 9 (without repetition).

- 14. Find the number of ways of forming a Committee of 5 members, out of 6 Indians and 5 Americans, so that always the Indians will be in majority in the Committee.
- 15. Resolve $\frac{x^4}{(x-1)(x-2)}$ into partial fractions.
- 16. Show that

$$1 + \frac{1}{3.2^2} + \frac{1}{5.2^4} + \frac{1}{7.2^6} + \dots = \log_e 3$$

17. A, B, C are three horses in a race. The probability of A to win the race is twice that of B and probability of B is twice that of C. What are the probabilities of A, B and C to win the race?

SECTION-C

 $5 \times 7 = 35$

H. Long answer type questions.

- (i) Answer ANY FIVE questions.
- (ii) Each question carries seven marks.
- 18. Solve the equation

$$x^5 - 5x^4 + 9x^3 - 9x^2 + 5x - 1 = 0$$

19. Prove that

$$\begin{vmatrix} b+c & c+a & a+b \\ c+a & a+b & b+c \\ a+b & b+c & c+a \end{vmatrix} = 2 \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$$

20. Solve the equations

$$x + y + 4z = 6$$
, $3x + 2y - 2z = 9$, $5x + y + 2z = 13$ by using Cramer's Rule.

21. If n is a positive integer, prove that

$$\sum_{r=1}^{n} \ r^{3} \left(\frac{{}^{n} \mathbf{C}_{r}}{{}^{n} \mathbf{C}_{r-1}} \right)^{2} = \frac{n(n+1)^{2}(n+2)}{12}$$

22. If $x = \frac{5}{(2!)3} + \frac{5 \cdot 7}{(3!)3^2} + \frac{5 \cdot 7 \cdot 9}{(4!)3^3} + \dots$

then find the value of $x^2 + 4x$.

- 23. State and prove Addition theorem on Probability.
- 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', and
 - (ii) find P(X < 1), $P(1 < X \le 2)$, $P(0 < X \le 3)$