# 266

**I**

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.***

**<u>SECTION - A</u>** **10×2=20**

**I.** *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 '$\alpha$'.

**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".

6. If ${}^{n}C_5 = {}^{n}C_6$, then find ${}^{13}C_n$

7. Find the number of terms in the expansion of $(2x+3y+z)^7$.

8. If $f(x) = 1 + \frac{x^2}{2!} + \frac{x^4}{4!} + \frac{x^6}{6!} + \ldots\ldots\infty$, then show that $f'(x) = \sinh x$.

9. If A, B are two events with $P(A \cup B) = 0.65$. $P(A \cap B) = 0.15$, then find the value of $P(A^c) + P(B^c)$.

10. If X is a Poisson variate with $P(X=0) = P(X=1) = k$, then show that $k = e^{-1}$.

## SECTION-B  5×4=20

**II.** *Short answer type questions.*

*(i)* Answer **ANY FIVE** questions.

*(ii)* 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 $A = \begin{bmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{bmatrix}$ is a non-singular matrix, then show that A is invertible and $A^{-1} = \frac{\text{Adj A}}{\det A}$.

13. 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

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

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** **5×7=35**

III. *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

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

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

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