266

II

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 consists of **three** Sections – **A**, **B** and **C**.

SECTION – A

$10 \times 2 = 20$

I. Very Short Answer Type questions :

(i) Attempt **all** the questions.

(ii) Each question carries **two** marks.

1. Find the square roots of $(-5 + 12i)$.

2. If $Z_1 = -1$ and $Z_2 = -i$, then find Arg $(Z_1 Z_2)$.

3. If $x = \text{cis } \theta$, then find the value of $\left(x^6 + \frac{1}{x^6}\right)$.

4. Find the values of m for which the equation $x^2 - 15 - m(2x - 8) = 0$ have equal roots.

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

6. If ${}^nP_7 = 42 \cdot {}^nP_5$, find n.

7. If ${}^{17}C_{2t+1} = {}^{17}C_{3t-5}$, find t.

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

9. Find the mean deviation from the mean of the following discrete data :
6, 7, 10, 12, 13, 4, 12, 16.

10. The mean and variance of a binomial distribution are 4 and 3 respectively. Fix the distribution and find $P(X \geq 1)$.

SECTION – B $5 \times 4 = 20$

II. Short Answer Type questions.

(i) Answer any **five** questions.

(ii) Each question carries **four** marks.

11. If $x + iy = \frac{1}{1 + \cos\theta + i\sin\theta}$, then show that $4x^2 - 1 = 0$

12. If x is real, prove that $\frac{x}{x^2 - 5x + 9}$ lies between $-\frac{1}{11}$ and 1.

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

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

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

16. State and prove Addition theorem on Probability.

17. Suppose A and B are independent events with $P(A) = 0.6$, $P(B) = 0.7$, then compute (i) $P(A \cap B)$ (ii) $P(A \cup B)$ (iii) $P\left(\frac{B}{A}\right)$ (iv) $P(A^c \cap B^c)$

SECTION – C $5 \times 7 = 35$

III. Long Answer Type questions :

(i) Attempt any **five** questions.

(ii) Each question carries **seven** marks.

18. If α, β are the roots of the equation $x^2 - 2x + 4 = 0$, then for any $n \in N$. Show that $\alpha^n + \beta^n = 2^{n+1} \cos\left(\frac{n\pi}{3}\right)$.

19. Solve $8x^3 - 36x^2 - 18x + 81 = 0$, given that the roots of this equation are in arithmetic progression.

20. If n is a positive integer and x is any non-zero real number, then prove that

$$C_0 + C_1 \cdot \frac{x}{2} + C_2 \cdot \frac{x^2}{3} + C_3 \cdot \frac{x^3}{4} + \ldots\ldots + C_n \cdot \frac{x^n}{n+1} = \frac{(1+x)^{n+1} - 1}{(n+1)x}$$

21. If $x = \frac{1}{5} + \frac{1.3}{5.10} + \frac{1.3.5}{5.10.15} \ldots\ldots + \infty$, then find $3x^2 + 6x$.

22. Find the mean deviation about the median for the following continuous distribution :

Age (Years)	20 – 25	25 – 30	30 – 35	35 – 40	40 – 45	45 – 50	50 – 55	55 – 60
No. of workers (f_i)	120	125	175	160	150	140	100	30

23. Suppose that an urn B_1 contains 2 white and 3 black balls and another urn B_2 contains 3 white and 4 black balls. One urn is selected at random and a ball is drawn from it. If the ball drawn is found black, then find the probability that the urn chosen was B_1.

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

$X = x$	0	1	2	3	4	5	6	7
$P(X = x)$	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2 + K$

Find (i) K, (ii) the mean and (iii) $P(0 < X < 5)$