

Total No. of Questions : 24
Total No. of Printed Pages : 2

Reg. No. _____

8120692

Question Booklet Sl. No.

Part - III MATHEMATICS - Paper - II(A)

(English Version)

Max. Marks : 75

Time : 3 Hours

Note : This question paper consists of **THREE** Sections - A, B and C.

(10x2=20)

SECTION - A

I. Very Short Answer Type questions.

(i) Answer **ALL** questions.(ii) **Each** question carries **TWO** marks.1) Find the square root of the complex number $7 + 24i$.2) If $z_1 = -1$ and $z_2 = i$, then find $\text{Arg} \left(\frac{z_1}{z_2} \right)$.3) If $1, \omega, \omega^2$ are the cube roots of unity, then find the value of $(1 - \omega + \omega^2)^5 + (1 + \omega - \omega^2)^5$.4) Form quadratic equation whose roots are $-3 \pm 5i$.5) If the product of the roots of $4x^3 + 16x^2 - 9x - a = 0$ is 9, then find a .

6) Find the number of ways of preparing a chain with 6 different coloured beads.

7) If ${}^nC_5 = {}^nC_8$, then find ${}^{13}C_n$.8) Find the middle term in the expansion of $\left(\frac{3x}{7} - 2y \right)^{10}$.

9) Find the mean deviation about the median for the following data :

4, 6, 9, 3, 10, 13, 2.

10) A Poisson variable satisfies $P(X=1) = P(X=2)$. Find $P(X=5)$.

SECTION B

(5×4=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 $x^2 - 1 = 0$.
- 12) Prove that $\frac{1}{3x+1} + \frac{1}{x+1} - \frac{1}{(3x+1)(x+1)}$ does not lie between 1 and 4, if x is real.
- 13) If the 6 letters of the word PRISON are permuted in all possible ways and the words thus formed are arranged in dictionary order, find the rank of the word PRISON.
- 14) Prove that $\frac{{}^{4n}C_{2n}}{{}^{2n}C_n} = \frac{1.3.5\dots(4n-1)}{(1.3.5\dots(2n-1))^2}$.
- 15) Resolve the following fraction into partial fractions $\frac{x^2 - 3}{(x+2)(x^2+1)}$.
- 16) Find the probability that a non-leap year contains (i) 53 Sundays (ii) 52 Sundays only.
- 17) 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.

SECTION C

(5×7=35)

III. Long Answer Type questions.

- (i) Answer **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 $n \in \mathbb{N}$ show that $\alpha^n + \beta^n = 2^{n+1} \cos\left(\frac{n\pi}{3}\right)$.
- 19) Solve the equation $x^5 - 5x^4 + 9x^3 - 9x^2 + 6x - 1 = 0$.
- 20) If n is a positive integer and x is any non zero real number, then prove that $C_0 + C_1 \cdot \frac{x}{2} + C_2 \cdot \frac{x^2}{3} + C_3 \cdot \frac{x^3}{4} + \dots + C_n \cdot \frac{x^n}{n+1} = \frac{(1+x)^{n+1} - 1}{(n+1)x}$.
- 21) If $t = \frac{4}{5} + \frac{4.6}{5.10} + \frac{4.6.8}{5.10.15} + \dots$, then prove that $9t = 16$.
- 22) Find the variance and standard deviation of the following frequency distribution.
- | | | | | | | | |
|-------|---|---|----|----|----|----|----|
| x_i | 4 | 8 | 11 | 17 | 20 | 24 | 32 |
| f_i | 3 | 5 | 9 | 5 | 4 | | 1 |
- 23) State and prove Baye's theorem on probability.
- 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) $P(0 < X < 5)$.