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III

Total No. of Questions : 24

Total No. of Printed Pages : 2

Reg. No.

Question Booklet Sl. 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

(10×2=20)

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 ${}^nC_5 = {}^nC_6$, 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 $P(X = 4) = P(X = 2)$. Find $P(X = 5)$.

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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 $4x^2 - 1 = 0$.

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 $\frac{^{4n}C_{2n}}{^{2n}C_n} = \frac{1.3.5...(4n-1)}{\{1.3.5...(2n-1)\}^2}$.

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 $n \in N$ show that $\alpha^n + \beta^n = 2^{n+1}\cos\left(\frac{n\pi}{3}\right)$.

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19) Solve the equation $x^5 - 5x^4 + 9x^3 - 9x^2 + 5x - 1 = 0$.

20) If n is a positive integer and x is any non zero real number, then prove that $C_0 + C_1\cdot\frac{x}{2} + C_2\cdot\frac{x^2}{3} + C_3\cdot\frac{x^3}{4} + ... + C_n\cdot\frac{x^n}{n+1} = \frac{(1+x)^{n+1}-1}{(n+1)x}$.

21) If $t = \frac{4}{5} + \frac{4.6}{5.10} + \frac{4.6.8}{5.10.15} + ...\infty$, 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	6	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).

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