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II

Total No. of Questions : **24**
Total No. of Printed Pages : **3**

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

I. Very Short Answer Type Questions. **10x2=20**
(i) Answer *all* the questions.
(ii) Each question carries *two* marks.

1. Write the complex number $\frac{4+3i}{(2+3i)(4-3i)}$ in the form $a+ib$.

2. Write $z=-\sqrt{7}+i\sqrt{21}$ in the polar form.

3. If 1, ω, ω^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 $\frac{p-q}{p+q}$, $-\frac{(p+q)}{p-q}$ $(p \neq \pm q)$.

5. Find the algebraic equation whose roots are 2 times the roots of $x^5-2x^4+3x^3-2x^2+4x+3=0$.

6. Find the number of (i) 6 (ii) 7 letter palindromes that can be formed using the letters of the word EQUATION.

7. If ${}^nP_r=5040$ and ${}^nC_r=210$, find n and r.

8. Find the number of terms with non-zero coefficients in $(4x-7y)^{49}+(4x+7y)^{49}$.

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

II. Short Answer Type Questions. 5x4=20

(i) Answer *any five* questions.
(ii) Each question carries *four* marks.

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

12. Determine the range of the expression $\dfrac{x + 2}{2x^2 + 3x + 6}$.

13. If the letter 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 $\dfrac{^{4n}C_{2n}}{^{2n}C_n} = \dfrac{1.3.5 \ldots (4n - 1)}{\{1.3.5 \ldots (2n - 1)\}^2}$

15. Resolve $\dfrac{x^2}{(x - 1)(x - 2)}$ into partial fractions.

16. If two numbers are selected randomly from 20 consecutive natural numbers, find the probability that the sum of the two numbers is (i) an even number (ii) an odd number.

17. Let A and B be independent events with P(A) = 0.2, P(B) = 0.5. Find :
(i) P(A | B) (ii) P(B | A) (iii) $P(A \cap B)$ and (iv) $P(A \cup B)$

SECTION - C

III. Long Answer Type Questions. 5x7=35

(i) Answer *any five* questions.
(ii) Each question carries *seven* marks.

18. Show that one value of $\left\{\dfrac{1 + \sin\frac{\pi}{8} + i\cos\frac{\pi}{8}}{1 + \sin\frac{\pi}{8} - i\cos\frac{\pi}{8}}\right\}^{\frac{8}{3}}$ is -1.

19. Solve the equation $x^4 + 2x^3 - 5x^2 + 6x + 2 = 0$ given that $1 + i$ is one of its roots.

20. If the 2nd, 3rd, 4th terms in the expansion of $(a+x)^n$ are respective 240, 720, 1080, find a, x, n.

21. If $x = \frac{1.3}{3.6} + \frac{1.3.5}{3.6.9} + \frac{1.3.5.7}{3.6.9.12} + \ldots\ldots$, then prove that $9x^2 + 24x = 11$.

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

Height (in cms)	95 - 105	105 - 115	115 - 125	125 - 135	135 - 145	145 - 155
No. of Boys	9	13	26	30	12	10

23. Three boxes numbered, I, II, III contain the balls as follow :

	White	Black	Red
I	1	2	3
II	2	1	1
III	4	5	3

One box is randomly selected and a ball is drawn from it. If the ball is red, then find the probability that it is from box II.

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

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