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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 × 2 = 20

I. Very Short Answer Type questions.

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

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

1. Find the multiplicative inverse of $7 + 24i$.

2. If $(\sqrt{3} + i)^{100} = 2^{99}(a + ib)$, show that $a^2 + b^2 = 4$

3. Find the cube roots of 8.

4. Find the quadratic equation whose roots are $-3 \pm 5i$.

5. If 1, 1, α are the roots of $x^3 - 6x^2 + 9x - 4 = 0$, then find α.

6. If $(n + 1)P_5 : nP_6 = 2 : 7$, find 'n'.

7. Find the number of permutations that can be made by using all the digits of the word MATHEMATICS.

8. Find the number of diagonals of a polygon with 12 sides.

9. Find the variance for the discrete data given below :

   6, 7, 10, 12, 13, 4, 8, 12

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

SECTION – B

$5 \times 4 = 20$

II. Short Answer Type questions.

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

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

11. Show that the four points in the Argand plane represented by the complex numbers $2 + i$, $4 + 3i$, $2 + 5i$, $3i$ are the vertices of a square.

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

14. Find the number of ways of selecting a cricket team of 11 players from 7 batsmen and 6 bowlers such that there will be atleast 5 bowlers in the team.

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

16. Find the probability of drawing an Ace or a Spade from a well shuffled pack of 52 playing cards.

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) $P(B/A)$ (iv) $P(A^c \cap B^c)$.

SECTION – C

5 × 7 = 35

III. Long Answer Type questions :

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

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

18. If 'n' is an integer then show that

$$(1 + i)^{2n} + (1 - i)^{2n} = 2^{n+1} \cos \frac{n\pi}{2}$$

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

20. Solve $x^4 + 4x^3 - 2x^2 - 12x + 9 = 0$, given that it has two pairs of equal roots.

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

22. Find the mean deviation from the mean of the following data, using the step deviation method :

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of Students	6	5	8	15	7	6	3

23. State and prove Addition 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) $P(0 < X < 5)$