0266

SET -

Total No. of Questions - **37**
Total No. of Printed Pages - **4**

Regd. No. | | | | | | | | | | |

Part - III

MATHEMATICS, Paper - IIA

(English Version)

MODEL QUESTION PAPER

(For the Academic year 2021-22 only)

***Time :* 3 Hours** **_Max. Marks :_ 75**

Note: This question paper consists of three sections A, B and C.

Section - A

Very short answer type questions.

(i) Answer ANY TEN questions.

(ii) Each question carries 2 marks. **10×2=20**

1. Write the multiplicative inverse of the complex number (sinθ, cosθ).
2. If $(a + ib)^2 = (x + iy)$, then find the value of $(x^2 + y^2)$.
3. If $Z_1 = (2, -1)$, $Z_2 = (6, 3)$ find $Z_1 - Z_2$.
4. If $x = \text{cis}\theta$, then find the value of $\left(x^6 + \frac{1}{x^6}\right)$.
5. If α, β are the roots of the equation $ax^2 + bx + c = 0$, then find the value of the expression $\left(\frac{1}{\alpha} + \frac{1}{\beta}\right)$ in terms of *a, b, c*.
6. Write the quadratic equations whose roots are 1, 2.
7. Find the algebraic equation whose roots are three times the roots of $x^3 + 2x^2 - 4x + 1 = 0\cdot$
8. Find the transformed equation whose roots the negatives of the roots of $x^4 + 5x^3 + 11x + 3 = 0\cdot$

Turn Over

9. Find the number of ways of arranging 5 different maths books, 4 different physics books and 3 different chemistry books such that the books of the same subject are together.

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

11. If ${}^{n}P_{3} = 1320$, find 'n'.

12. Find the 7^{th} term in the expansion of $\left(1-\frac{x^2}{3}\right)^{-4}$.

13. Find the mean deviation from the mean of the following data

6, 7, 10, 12, 13, 4, 12, 16

14. The probability that a person chosen at random is left handed in handwriting is 0.1. What is the probability that in a group of 10 people, there is one who is left handed?

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

Section - B

Short answer type questions. **5×4=20**

(i) Answer any FIVE questions.

(ii) Each question carries four marks.

16. If x and y are real numbers, such that $\frac{(1+i)x-2i}{3+i}+\frac{(2-3i)y+i}{3-i}=i$, then determine the values of x and y.

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

18. If 1, ω, ω^2 are the cube roots of unity, then prove that

$(2-\omega)(2-\omega^2)(2-\omega^{10})(2-\omega^{11}) = 49$.

19. Find the range of the expression $\frac{x+2}{2x^2+3x+6}$.

20. Solve $x^3-7x^2+14x-8=0$, given that the roots are in geometric progression.

21. Find the sum of all 4 digited numbers that can be formed using the digits 1, 2, 4, 5, 6 without repetition.

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

23. Resolve $\frac{x^2+5x+7}{(x-3)^3}$ into partial fractions.

24. Resolve $\dfrac{x^3}{(x-a)(x-b)(x-c)}$ into partial fractions.

25. Resolve $\dfrac{2x+3}{(x-1)^3}$ into partial fractions.

26. A and B are events with P(A) = 0.5, P(B) = 0.4 and P(A⋂B) = 0.3. Find the probability that (i) A does not occur (ii) neither A nor B occurs.

27. State and prove Multiplication Theorem of Probability.

Section - C

Long Answer type questions. **5×7=35**

(i) Answer any FIVE questions.

(ii) Each question carries seven marks.

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

29. Let $a, b, c \in \mathbf{R}$ and $a \neq 0$ such that the equation $ax^2+bx+c=0$ has real roots α, β with α < β. Prove that the expression ax^2+bx+c and 'a' have same sign when $x < \alpha$ or $x > \beta$.

30. Solve $x^4-4x^2+8x+35=0$, given that $2+i\sqrt{3}$ is a root.

31. Find the polynomial equation whose roots are the translates of the roots of the equation $x^4-5x^3+7x^2-17x+11=0$ by –2.

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

33. Find the numerically greatest terms in the expansion of $(3x-4y)^{14}$ when $x = 8, y = 3$.

34. In a box containing 15 bulbs, 5 are defective. If 5 bulbs are selected at random from the box, then find the probability of the event that

(i) none of them is defective

(ii) only one of them is defective

(iii) atleast one of them is defective

35. If A, B, C are three independent events of a random experiment such that $P\left(A\cap\overline{B}\cap\overline{C}\right)=\dfrac{1}{4}$, $P\left(\overline{A}\cap B\cap\overline{C}\right)=\dfrac{1}{8}$, $P\left(\overline{A}\cap\overline{B}\cap\overline{C}\right)=\dfrac{1}{4}$ then find P(A), P(B) and P(C).

Turn Over

36. Let X be a random variable such that $P(X = -2) = P(X = -1) = P(X = 2) = P(X = 1) = \frac{1}{6}$ and $P(X = 0) = \frac{1}{3}$. Find the mean and variance of X.

37. If the difference between the mean and variance of a binomial variate is $\frac{5}{9}$, then find the probability for the event of 2 successes when the experiment is conducted five times.

—————