

(i) Printed Pages : 2

Roll No.

(ii) Questions : 9

Sub. Code :

1	0	9	0	4
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Exam. Code :

5	0	0	3
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NEP U.G. Common-Inter Disciplinary Course 3rd Semester
(2125)

MATHEMATICS

Paper : Algebra

Time Allowed : Three Hours]

[Maximum Marks : 60

Note :— Attempt any **FOUR** questions in all, selecting **ONE** question from each unit. Question No. 1 is compulsory.

1. (a) Let $P(n)$ be the statement " $2^n > 3n$ for $n \in \mathbb{N}$ ". Show that $P(1)$ is not true.
- (b) Simplify i^7 .
- (c) Find the modulus of complex number $-4 + 3i$
- (d) Find $p(x) + q(x)$ where polynomials $p(x) = 2 + 3x + 4x^3$ and $q(x) = 1 + 2x + 2x^2$.
- (e) Construct 2×3 matrix $A = (a_{ij})$ where $a_{ij} = i + j$.
- (f) Find the determinant of matrix $A = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$.

2×6=12

UNIT-I

2. By mathematical induction prove that

$$1 + 3 + 5 + \dots + (2n - 1) = n^2, \forall n \in \mathbb{N}. \quad 16$$

3. Solve the inequalities graphically

$$5x + 4y \leq 40; \quad x \geq 2, \quad y \geq 3. \quad 16$$

UNIT-II

4. If $z_1 = 1 - i$, $z_2 = -2 + 4i$ then find $\operatorname{Im}\left(\frac{z_1 z_2}{\bar{z}_1}\right)$. 16

5. Use Horner's Method of synthetic division to divide

$$6x^4 + 11x^3 + 13x^2 - 3x + 27 \text{ by } 3x + 4. \quad 16$$

UNIT-III

6. (a) If $A = B^t$ where $A = \begin{bmatrix} a+b & 2 \\ 5 & b \end{bmatrix}$ & $B = \begin{bmatrix} 6 & 5 \\ 2 & 2 \end{bmatrix}$ find "a" & "b".

(b) Find "k" so that $A^2 = kA$ where $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$.

$$8+8=16$$

7. Without expanding prove that

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a - b)(b - c)(c - a). \quad 16$$