

7. Solve the following system of equations using matrix method :

$$x - y - z = 1$$

$$2x + y + z = 2$$

$$x - 2y + z = 4. \quad 4$$

Section D

8. Form an equation with rational co-efficients two of whose roots are $1+5i$ and $5-i$. 4
9. Solve the equation :

$$x^4 + x^3 - 16x^2 - 4x + 48 = 0,$$

having given that the product of two of the roots is 6. 4



No. of Printed Pages : 04

Roll No.

34194

B. A. (NEP-2020) EXAMINATION, 2025

(Second Semester)

BASIC ALGEBRA

B23-MAT-203

Time : 3 Hours]

[Maximum Marks : 20

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting *one* question from each Section. Q. No. 1 is compulsory. All questions carry equal marks.

(Compulsory Question)

1. (a) What are equivalent matrices ?
- (b) Define characteristic vectors of a matrix.
- (c) Define Cayley-Hamilton theorem.
- (d) Define Factor theorem. $4 \times 1 = 4$

Section A

2. Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \\ 1 & 1 & 1 \end{bmatrix}$. 4

3. Find the characteristic roots of matrix :

$$A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}. \quad 4$$

Section B

4. Verify Cayley-Hamilton theorem for the matrix :

$$A = \begin{bmatrix} 0 & 0 & 1 \\ 3 & 1 & 0 \\ -2 & 1 & 4 \end{bmatrix}. \quad 4$$

5. Prove that the given matrix is orthogonal :

$$A = \frac{1}{3} \begin{bmatrix} -1 & 2 & 2 \\ 2 & -1 & 2 \\ 2 & 2 & -1 \end{bmatrix}. \quad 4$$

Section C

6. Solve the following system of equations using Cramer's rule :

$$2x + 3y + z = 9$$

$$4x + y = 7$$

$$x - 3y - 7z = 6. \quad 4$$