

Roll No.: .....

Unique Paper Code : 32371202\_OC

Name of the Paper : Algebra

Name of the Course : B.Sc. (H) Statistics Under CBCS

Semester : II

Duration : 3 hours

Maximum Marks : 75 Marks

**Instructions for candidates:**

Attempt any FOUR questions.

All questions carry equal marks.

Show all the intermediate calculations and results.

Use of simple calculator is allowed.

1. For the matrix  $A = \begin{bmatrix} 1 & 3 & 6 & -1 \\ 1 & 4 & 5 & 1 \\ 1 & 5 & 4 & 3 \end{bmatrix}$  find the non-singular matrices P and Q such that PAQ is in normal form. Hence determine the rank of the matrix A.

2. For what values of  $\lambda$ , does the system of equations:

$$x + y + z = 1$$

$$x + 2y + 4z = \lambda$$

$$x + 4y + 10z = \lambda^2$$

have a solution? Solve them completely in each case.

3. Find the characteristic equation of the matrix

$$A = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$$

and verify Cayley Hamilton theorem. Hence compute  $A^{-1}$ .

4. Find the rank, index and signature of the quadratic form

$$2(x_1^2 + x_2^2 + x_3^2) + x_4^2 + 2x_1x_2 - 2x_2x_3 + 2x_3x_1.$$

5. Find generalized inverse of the matrix

$$A = \begin{bmatrix} -1 & 1 & 6 & 8 & 2 \\ 0 & 4 & 1 & 3 & 2 \\ -1 & 5 & 7 & 11 & 4 \end{bmatrix}$$

and verify  $AGA = A$ .

6. Find the inverse of the matrix

$$A = \begin{pmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{pmatrix}$$

by partitioned method. Also, verify  $AA^{-1} = I$ .



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