

## UNIT 2 – ORTHOGONAL TRANSFORMATION OF A REAL SYMMETRIC MATRIX

Nature of the quadratic form

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Nature of the quadratic form

Find rank, index, signature and nature

$$2x_1^2 + 2x_2^2 + x_3^2 + 4x_1x_2 = 0$$

The matrix form is

$$A = \begin{bmatrix} 2 & 2 & 0 \\ 2 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Characteristic equation ,Eigen values,Eigen vectors

$C_1$  =Sum of leading diadonal elements

$$=2+2+1 =5$$

$C_2$ = Sum of minors of leading diagonal elements

$$=4$$

$C_3=|A|$

$$= \begin{vmatrix} 2 & 2 & 0 \\ 2 & 2 & 0 \\ 0 & 0 & 1 \end{vmatrix}$$

$$= 0$$

The characteristic equation is

$$\lambda^3 - 5\lambda^2 + 4\lambda = 0$$

The eigen values are 0,1,4

The index  $p=2$

Rank  $r=2$

Signature  $s=2p-r =2$

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The nature is semi positive