NATURE OF QUADRATIC FORM

i) Positive definite

all the eigen values of A are positive.

Example $\lambda = 1, 2, 3$

ii) Negative definite

all the eigen value of A are negative and

Example $\lambda = -1; -2, -3$

iii) Positive semi definite.

all the eigenvalue of A are non-negative
and atleast one eigenvalue is zero.

eg $\lambda = 0, 1, 2$

iv) Negative semi definite.

all the eigenvalues of A are non-positive
and atleast one eigen value is zero

E.g $\lambda = 0, -1, -3$

v) Indefinite

Some eigenvalues are positive and some
eigenvalues are negative

Eg $\lambda = -1, 1, 2$

$\lambda = -2, -1, 2$

REDUCE QUADRATIC FORM TO CANONICAL FORM

Example 1 : write the matrix of the quadratic
form $\to 2x_1^2 - 2x_2^2 + 4x_3^2 + 2x_1 x_2 - 6x_1 x_3 + 6x_2 x_3$

Sol $Q = a_{11} x_1^2 + a_{22} x_2^2 + a_{33} x_3^2 + 2a_{12} x_1 x_2 + 2a_{23} x_1 x_3 + 2a_{31} x_3 x_4$

$$\begin{bmatrix} 2 & 1 & -3 \\ 1 & -2 & 3 \\ -3 & 3 & 4 \end{bmatrix}$$