DEFINITION OF QUADRATIC FORM:

A homogeneous polynomial of degree 2 with any number of variables are known as quadratic form

$$x^2 + y^2 + z^2 + 2xy + 2yz + 2zx = 0$$

$$\left[co\,eff\,of\,x^2\ \tfrac{1}{2}co\,eff\,of\,xy\ \tfrac{1}{2}co\,eff\,of\,xz\ \tfrac{1}{2}co\,eff\,of\,yx\ co\,eff\,of\,x^2\ \tfrac{1}{2}co\,eff\,of\,yz\ \tfrac{1}{2}co\,eff\,of\,zx\ \right.$$

WORKING RULE:

STEP 1:Write the matrix o the quadratic form .then find D=$N^T AN$

By orthogonal transformation.

STEP 2: Find $Q = Y^T DY$

INDEX OF QUADRATIC FORM

The no of positive square terms in the canonical form is called the index of the quadratic form.It is denoted by p

SIGNATURE OF QUADRATIC FORM

The different of positive and negative square terms are called signature of quadratic terms .denoted by s

s=2p-r

NATURE OF QUDARTIC FORM :

Positive definite Ex: 1,2,2

Negative definite Ex: -1,-2-,2

Semi Positive Ex: 0,1,2

Semi negative Ex: 0,-1,-2

Indefinite Ex: -1,1,2

-2,-1,1

Problems:

1.Find the nature of the given equation $2x^2 + 2xy + 3y^2 = 0$

STEP 1:The matrix form

$A = (2\ 1\ 1\ 3\ )$

c_1 = Sum Of Diagonal Elements

= 2+3 =5

$c_2 = |A| = |2\ 1\ 1\ 3\ |$ =5

The characteristic equation is

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

Here $c_1 and\ c_2$ are positive

Hence the nature of the given matrix is positive definite