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# SNS COLLEGE OF TECHNOLOGY



(An Autonomous Institution) Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai Accredited by NAAC-UGC with 'A++' Grade (Cycle III) & amp; Accredited by NBA (B.E - CSE, EEE, ECE, Mech & amp; B.Tech.IT) COIMBATORE-641 035, TAMIL NADU

#### **DEPARTMENT OF MATHEMATICS**

### UNIT II

**ORTHOGONAL TRANSFORMATION OF A REAL SYMMETRIC MATRIX** 

	에 가지 것 같은 것이다. 이 것 같은 것이다. 그는 것을 알려요. 이 것이다. 한 것은 것이 같은 것이다. 것 같은 것을 알고 있다. 같은 것이 것 같아요. 이 이 것은 것 같아요. 같은 것 같아요. 이 것이다. 이 것 같은 것이다. 것이 같이 가지 않는 것이다. 것 같은 것은 것이다.
1	Write the quadratic form for the following
r	soln: $ \begin{bmatrix} 1 & 1 & -1 \\ 1 & 2 & 1 \\ -1 & 1 & 3 \end{bmatrix} $ $ \begin{bmatrix} 2 & 6 & -2 \\ 6 & 1 & -4 \\ -2 & -4 & -3 \end{bmatrix} $
(	i) $A = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix} = \begin{pmatrix} 1 & 1 & -1 \\ 1 & 2 & 1 \\ -1 & 1 & 3 \end{pmatrix}.$
	$Q = a_{11} x_1^2 + a_{22} x_2^2 + a_{33} x_3^2 + 2 a_{12} x_1 x_2$
	$+ 2a_{23}x_2x_3 + 2a_{31}x_3x_1$
	$Q_{r} = \chi_{1}^{2} + 2\chi_{2}^{2} + 3\chi_{3}^{2} + 2\chi_{1}\chi_{2} + 2\chi_{2}\chi_{3} - 2\chi_{3}\chi_{1}$
	(ii) $Q = 2x_1^2 + x_2^2 - 3x_3^2 + 12x_1x_2 - 8x_2x_3 - 4x_1x_3$
	Canonical form :
	For a real quadratic form $Q = X^T A X$ ,
	the canonical form is YTDY (or)
	방법은 이 집안 방법을 얻는 것 같은 것은 것은 것은 것은 것은 것은 것은 이렇지 특별할 것으로 많아. 것 같아. 것 그 동물을 들고 있는 것 것 같아. 것 같아. 집 것 같아. 요. 그는 것 같아.
	$\lambda_1 y_1^2 + \lambda_2 y_2^2 + \cdots + \lambda_n y_n^2$



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Problems : Determine the nature of the following quadratice form  $\chi_1^2 + 2\chi_2^2$ Matrix of the quadratic form  $= \begin{pmatrix} \cos \theta & o & \pi_1^2 \\ \frac{1}{2} \cos \theta & o & \pi_1^2 \\ \frac{1}{2} \cos \theta & o & \pi_2^2 \\ \frac{1}{2} \cos \theta & \sigma & \pi_$  $= \left(\begin{array}{ccc} 1 & 0 & 0 \\ 0 & 2 & 0 \end{array}\right)$ The eigen values are 1,2,0 Nature = Positive Seri definite. Find the rank, index, Signature and nature for the following Canonical forms : (i)  $y_1^2 + 3y_2^2 + 4y_3^2$  $(ii) - y_1^2 + y_2^2 + 4 y_3^2$ (iii)  $3y_2^2 + 15y_3^2$ soln: (i)  $y_1^2 + 3y_2^2 + 4y_3^2$ Rank = number of non-zero eigen values = 3



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Index = number of positive Square terms = 3  
Signature = Difference between positive and negative  
Square terms  
= 
$$3-o = 3$$
  
Nature = positive definite  
(ii)  $-y_1^2 + y_2^2 + 4y_3^2$   
Yank = 3  
Index = 2  
Signature =  $2-1 = 1$   
Nature = Indefinite  
(iii)  $3y_2^2 + 15y_3^2$   
 $= 0y_1^2 + 3y_2^2 + 15y_3^2$   
Tank =  $2$   
Signature =  $2$   
Nature = positive Semi definite



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