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**MAT 204**

**COMPUTER SCIENCE**

**18/SCI01/014**

$$A = \begin{pmatrix} 0 & 1 & 3 \\ -1 & 0 & 2 \\ 4 & -2 & 1 \end{pmatrix} \quad B = \begin{pmatrix} 4 & 2 & 1 \\ 3 & 1 & -1 \\ 2 & 0 & 1 \end{pmatrix} \quad C = \begin{pmatrix} 4 & 3 & 0 \\ 6 & 1 & -1 \\ 5 & 2 & -4 \end{pmatrix}$$

**i. LINEAR TRANSFORMATION OF A , IF VEXTOR  $x = (a,b,c)$**

$$A = \begin{pmatrix} 0 & 1 & 3 \\ -1 & 0 & 2 \\ 4 & -2 & 1 \end{pmatrix} \quad x = \begin{pmatrix} a \\ b \\ c \end{pmatrix}$$

$$T(x) = a \begin{pmatrix} 0 \\ -1 \\ 4 \end{pmatrix} + b \begin{pmatrix} 1 \\ 0 \\ -2 \end{pmatrix} + c \begin{pmatrix} 3 \\ 2 \\ 1 \end{pmatrix}$$

$$\begin{pmatrix} 0 \\ -a \\ 4a \end{pmatrix} + \begin{pmatrix} b \\ 0 \\ -2b \end{pmatrix} + \begin{pmatrix} 3c \\ 2c \\ c \end{pmatrix}$$

$$T(x) = \begin{pmatrix} 0 + b + 3c \\ -a + 0 + 2c \\ 4a - 2b + c \end{pmatrix}$$

Hence the transformation of  $\begin{pmatrix} a \\ b \\ c \end{pmatrix}$  gives;  $\begin{pmatrix} b + 3c \\ -a + 2c \\ 4a - 2b + c \end{pmatrix}$

ii. **RANK OF (B + C) TRANSPOSE**

$$|B+C| = \begin{pmatrix} 8 & 5 & 1 \\ 9 & 2 & -2 \\ 7 & 2 & -3 \end{pmatrix}$$

$$|B+C|^T = \begin{pmatrix} 8 & 9 & 7 \\ 5 & 2 & 2 \\ 1 & -2 & -3 \end{pmatrix}$$

$$|B+C|^T = 1(-6 + 4) - 9(-15 - 2) + 7(-10 - 2)$$

$$|B+C|^T = -16 + 153 - 84 = 53$$

IT IS NOT EQUAL TO 0; HENCE THE RANK OF **(B + C) TRANSPOSE** IS **3**

iii. **If Matrix A is a Singular or non-singular Matrix**

$$|A| = \begin{pmatrix} 0 & 1 & 3 \\ -1 & 0 & 2 \\ 4 & -2 & 1 \end{pmatrix}$$

$$|A| = 0(0 + 4) - 1(-1 - 8) + 3(2 - 0)$$

$$|A| = 0 + 9 + 6 = 15$$

IT IS NOT EQUAL TO 0; HENCE It is a non-singular matrix

**If Matrix B is a Singular or non-singular Matrix**

$$|B| = \begin{pmatrix} 4 & 2 & 1 \\ 3 & 1 & -1 \\ 2 & 0 & 1 \end{pmatrix}$$

$$|B| = 4(1 - 0) - 2(3 + 2) + 1(0 - 2)$$

$$|B| = -22 + 94 + 1496 = 1568$$

IT IS NOT EQUAL TO 0; HENCE, It is a non-singular matrix

**If Matrix C is a Singular or non-singular Matrix**

$$|C| = \begin{pmatrix} 4 & 3 & 0 \\ 6 & 1 & -1 \\ 5 & 2 & -4 \end{pmatrix}$$

$$|C| = 4(-4 + 2) - 3(-24 + 5) + 0(12 - 5)$$

$$|C| = -8 + 57 + 0 = 49$$

IT IS NOT EQUAL TO 0; HENCE, It is a non-singular matrix