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MAT 204

COMPUTER SCIENCE

18/SCI01/084

A **linear transformation**, $T: V \rightarrow V'$ is a function that carries elements of the vector space U (called the **domain**) to the vector space V (called the **codomain**), and which has two additional properties

1. $T(u_1+u_2)=T(u_1)+T(u_2)$ for all $u_1, u_2 \in U$

$$D = \begin{vmatrix} 1 & 3 & A \\ i & 0 & 2 \\ 4 & 2 & 1 \end{vmatrix} \quad E = \begin{vmatrix} 3 & 3 & 0 & A \\ 2 & 1 & -1 & \\ L^1 & & & \\ 3 & -1 & & \end{vmatrix}$$

2. $T(au)=aT(u)$ for all $u \in U$ and all $a \in \mathbb{C}$

$$A = \begin{vmatrix} 4a & & & \\ 0 & 1 & 3 & A \\ -1 & 0 & 2 & \\ L & 4 & -2 & 1 & J \end{vmatrix} \quad B = \begin{vmatrix} P & 2 & 1 & A \\ 3 & 1 & -1 & \\ & & & \\ & & & 0 & 1 & J \end{vmatrix} \quad C = \begin{vmatrix} n & 3 & 0 & A \\ 6 & 1 & -1 & \\ b & 2 & -4 & J \end{vmatrix}$$

LINEAR TRANSFORMATION OF A, IF VECTOR $x = (a, b, c)$

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

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

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

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

Hence the transformation of $\begin{pmatrix} a \\ b \\ c \end{pmatrix}$ gives; $\begin{pmatrix} -a + b + 3c \\ -a + 0 + 2c \\ -4a - 2b + c \end{pmatrix}$

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

ii. LINEAR TRANSFORMATION OF VECTOR $x = (a, b, c)$

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

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

$$2a + 0 + c$$

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

Hence the transformation of $x = \begin{pmatrix} a \\ b \end{pmatrix}$ gives;

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

iii. **LINEAR TRANSFORMATION OF VECTOR**
 $x = (a, b, c)$

$T(x) = a$

$$T(x) = \begin{pmatrix} 4a + 3b \\ 6a - c \\ 5a + 2b \end{pmatrix}$$

$$\begin{pmatrix} 4 \\ 6 \\ 5 \end{pmatrix} + b \begin{pmatrix} 3 \\ 1 \\ 2 \end{pmatrix} + c \begin{pmatrix} 1 \\ -1 \\ -4 \end{pmatrix}$$

Hence the transformation.

Gives

$$\begin{pmatrix} 4a + 3b + 0 \\ 6a + b - c \\ 5a + 2b - 4c \end{pmatrix}$$

iv. LINEAR TRANSFORMATION OF VECTOR $x = (a, b, c)$

$$D = \begin{vmatrix} r & 0 & 1 & 3 & A \\ & 1 & 0 & 2 & \\ L & 4 & 2 & 1 & J \end{vmatrix} \quad x = \begin{vmatrix} a \\ b \\ c \end{vmatrix}$$

$$\begin{vmatrix} 0 \\ 1 \\ \langle 4 \rangle \end{vmatrix} + b \begin{vmatrix} \langle 1 \rangle \\ 0 \\ .2 \end{vmatrix} + c \begin{vmatrix} 3 \\ 2 \\ \end{vmatrix}$$

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

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

Hence the transformation of $\begin{vmatrix} "a" \\ b \\ c \\ X. \end{vmatrix}$ gives; $\begin{vmatrix} \langle 0 + b + 3c \rangle \\ a + 0 + 2c \\ 4a + 2b + c \\ y \end{vmatrix}$

v. LINEAR TRANSFORMATION OF VECTOR $x = (a,b,c)$

$$x = \begin{vmatrix} a \\ b \\ c \end{vmatrix}$$

$$T(x) = \begin{vmatrix} 0 \\ -i \\ L^{-1} \end{vmatrix} + c \begin{vmatrix} 3 \\ 1 \\ 3 \end{vmatrix}$$

$$\begin{vmatrix} 3a \\ 2a \end{vmatrix} + \begin{vmatrix} \langle 3b \rangle \\ b \end{vmatrix} + \begin{vmatrix} 0 \\ -c \end{vmatrix}$$

$|a\rangle$ $|3b\rangle$ $|\langle -c$

$\langle 1)$

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$$\begin{array}{l} 3a + 3b + 0 \\ 2a + b - c \\ a - 3b - c \end{array}$$

Hence the transformation of

$$\langle a \rangle \text{ gives } \langle 3a + 3b + 0$$

b

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$$a - 3b - c_y$$

$$2a + b - c$$

c

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$$a - 3b - c_y$$