Ganpat University-Institute of Computer Technology

Computer Science & Engineering Department

Subject : Linear Algebra **Faculty : DSD**

<u>Assignment 1 – Answer Keys</u>

Q.1 Find out the Linear Dependence / Independence of vectors for following. If dependent find the relation :

1) x1 = (1,-1,1) ; x2 = (2,1,1); x3 = (3,0,2) **[Ans : Dependent; x3 = x1 + x2]**

2) x1 = (3,2,7) ; x2 = (2,4,1); x3 = (1,-2,6) **[Ans : Dependent ; x1 = x2 + x3]**

3) x1 = (1,3,4,2) ; x2 = (3,-5,2,6); x3 = (2,-1,3,4) **[Ans : Dependent ; x1 = 2x3 – x2]**

Q.2 Check whether the systems of linear equations are consistent. If they are, then find solution also.

1) $x - 3y - 8z = -10$ **[Ans : Consistent; x = 2k-1, y = 3-2k, z = k]**

$3x + y - 4z = 0$

$2x + 5y + 6z = 13$

2) $4x - 2y + 6z = 8$ **[Ans : Consistent; x = 1, y = 3k-2, z = k]**

$x + y - 3z = -1$

$15x - 3y + 9z = 21$

Q.3 Find the values of λ for which the equations $x + 2y + z = 3$; $x + y + z = \lambda$ and $3x + y + 3z = \lambda^2$ are consistent. Solve them for these values of λ.

[Ans : Consistent for λ = 2 & 3; For λ = 2 -> x = k, y = 1, z = -k & λ = 3 -> x = k, y = 0, z = 3-k]

Q.4 Find the Eigen Values & Eigen Vectors for following matrices :

(1) $$\begin{pmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{pmatrix}$$

Ans : λ = 2, 2, 3 ; For λ = 2, 2 -> X1 = X2 = $\begin{vmatrix} \mathbf{5} \\ \mathbf{2} \\ \mathbf{-5} \end{vmatrix}$

For λ = 3 -> X3 = $\begin{vmatrix} \mathbf{-1} \\ \mathbf{-1} \\ \mathbf{2} \end{vmatrix}$

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(2) $$\begin{pmatrix} 11 & -4 & -7 \\ 7 & -2 & -5 \\ 10 & -4 & -6 \end{pmatrix}$$

Ans : λ = 0, 1, 2 ; For λ = 0 -> X1= $\begin{vmatrix} \mathbf{1} \\ \mathbf{1} \\ \mathbf{1} \end{vmatrix}$

For $\lambda = 1$ ->X2= $\begin{vmatrix} \mathbf{1} \\ \mathbf{-1} \\ \mathbf{2} \end{vmatrix}$

For $\lambda = 2$ -> X3= $\begin{vmatrix} \mathbf{2} \\ \mathbf{1} \\ \mathbf{2} \end{vmatrix}$

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(3)

$$\begin{pmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{pmatrix}$$

Ans : $\lambda = 2, 2, 8$; For $\lambda = 2$ -> X1 = $\begin{vmatrix} \mathbf{1} \\ \mathbf{0} \\ \mathbf{-2} \end{vmatrix}$

For $\lambda = 2$ ->X2= $\begin{vmatrix} \mathbf{1} \\ \mathbf{2} \\ \mathbf{0} \end{vmatrix}$

For $\lambda = 2$ ->X3= $\begin{vmatrix} \mathbf{2} \\ \mathbf{-1} \\ \mathbf{1} \end{vmatrix}$
