

DEPARTMENT OF BASIC SCIENCES AND ISLAMIAT
University of Engineering and Technology, Peshawar Campus
(Computer System Engineering Engineering)

Linear Algebra (BSI-111) 3rd Semester Fall-2021

Assignment NO.1

CLO-1, Cognitive Domain, PLO-2, Taxonomy Level-2

Q1

Given the linear system

$$2x - y = 5$$

$$4x - 2y = t$$

- (i) Determine a value of t so that the system has a solution.
- (ii) Determine a value of t so that the system has no solution.
- (iii) How many different values of t can be selected in part (ii)?

Q2

(a) Define linear combinations of matrices.

(b) Is the matrix $A = \begin{bmatrix} 4 & 1 \\ 0 & -3 \end{bmatrix}$ a linear combination of the matrices

$$A_1 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \text{ and } A_2 = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix} ? \text{ Justify your answer.}$$

Q3.

(a) A plastics manufacturer makes two type of plastic regular and special each ton of Regular plastic requires 2 hours in plant A and 5 hours in plant B; each ton of special Plastic requires 2 hours in plant A and 3 hours in plant B. If plant A is available 8 Hours per day and plant B is available 15 hours per day, how many tons of each Type of plastic can be made daily so that the Plants are fully utilized and Discuss?

(b) Let 0 represent OFF and 1 represent ON and

$$A = \begin{bmatrix} ON & ON & OFF \\ OFF & ON & OFF \\ OFF & ON & ON \end{bmatrix}$$

Find the ON/OFF matrix B so that $A + B$ is a matrix with each entry ON.

Q4

Let $S_1 = [18.95 \quad 14.75 \quad 8.98]$ and $S_2 = [17.80 \quad 13.50 \quad 10.79]$ be 3-vector denoting the current prices of three items at stores A & B, respectively.

- i) Obtain a 2×3 matrix representing the combined information about the prices of the three items at the two stores.
- ii) Suppose that each store announces a sale so that the price of each items is reduced by 20% obtain a 2×3 matrix representing the sale prices at the two stores.

Q5.

The matrix transformation $f: R^2 \rightarrow R^2$ defined by $f(v) = Av$ where

$$A = \begin{bmatrix} 1 & 0 \\ 0 & K \end{bmatrix}$$

Where K is a real number is called dilation in the y - direction if $k > 1$ and contraction in the y - direction if $0 < k < 1$. If R is the unit square and f is the contraction in the y -direction with $k = \frac{1}{2}$, find and sketch the image of R .