INFORMATION TECHNOLOGY UNIVERSITY, LAHORE, PAKISTAN

BS Computer and Software Engineering

Linear Algebra

Quiz# 7 (BSSE23-A), Fall 2024

November 26, 2024

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Maximum Time Allowed: 10 minutes Maximum Marks: 10

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1. Solve the system of differential equations: [6]

$$\frac{dy_1}{dt} = y_1 + y_2$$

$$\frac{dy_2}{dt} = 4y_1 - 2y_2$$

2. Find the solution that satisfies the initial condition $y_1(0) = 1$ and $y_2(0) = 6$. [4]

$$\begin{bmatrix} y_1' \\ y_2' \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ 4 & -2 \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \end{bmatrix}.$$

$$\frac{dy}{dt} = Ay.$$

$$|A - \lambda I| = 0$$

for $\lambda_1 = 2$

$$\begin{bmatrix} 1-2 & 1 \\ 4 & -2-2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} -1 & 1 \\ 4 & -4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} x_1 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

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Zunaira Abdul Aziz
A.

Q) Let $Ax = b$. be the linear system

$$\begin{bmatrix} -1 & 3 & 2 \\ 1 & 2 & -3 \\ 2 & 1 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ -9 \\ -3 \end{bmatrix}$$

(02)

Show that the b is in the column space of A and express b as a linear combination of column vectors of A.

$$\left[\begin{array}{ccc|c} -1 & 3 & 2 & 1 \\ 1 & 2 & -3 & -9 \\ 2 & 1 & -1 & -3 \end{array}\right] \quad R1 \leftarrow \frac{R1}{-1}$$

$$\left[\begin{array}{ccc|c} 1 & -3 & -2 & -1 \\ 1 & 2 & -3 & -9 \\ & & & \end{array}\right]$$

$R2 \leftarrow R2 + (-1)R1$
$R3 \leftarrow R3 + (-2)R1$