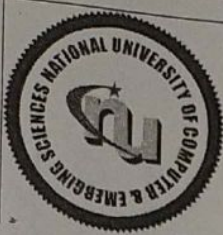


3A

Quiz (3)

National University of Computer and Emerging Sciences, Lahore Campus



Course:	Linear algebra	Course Code:	
Program:		Semester:	
Duration:		Total Marks:	03
Paper Date:	16/12/2021	Weight:	
Section:	BS SE 3A	Page(s):	
Exam:		Roll No:	

Instruction/Notes:

Attempt All Questions

Q1 Find the characteristic equation & eigenvalues of the matrix $A = \begin{bmatrix} -2 & -7 \\ 1 & 2 \end{bmatrix}$

characteristic Eq.:

$$\det(\lambda I - A) = 0$$

$$\left| \lambda \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} - \begin{bmatrix} -2 & -7 \\ 1 & 2 \end{bmatrix} \right| = 0$$

$$\left| \begin{bmatrix} \lambda & 0 \\ 0 & \lambda \end{bmatrix} - \begin{bmatrix} -2 & -7 \\ 1 & 2 \end{bmatrix} \right| = 0$$

$$\begin{vmatrix} \lambda+2 & 7 \\ -1 & \lambda-2 \end{vmatrix} = 0$$

$$(\lambda+2)(\lambda-2) - (-1)(7) = 0$$

$$\lambda^2 - 2\lambda + 2\lambda - 4 + 7 = 0$$

$$\lambda^2 + 3 = 0, \lambda^2 = -3$$

characteristic eq. No real eigen values

Q2 Find matrix P that diagonalizes A & check your work by computing $P^{-1}AP$. ; $A = \begin{bmatrix} 4 & 0 \\ 2 & 4 \end{bmatrix}$

characteristic Eq.

$$\det(\lambda I - A) = 0$$

$$\left| \lambda \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} - \begin{bmatrix} 4 & 0 \\ 2 & 4 \end{bmatrix} \right| = 0$$

$$\left| \begin{bmatrix} \lambda & 0 \\ 0 & \lambda \end{bmatrix} - \begin{bmatrix} 4 & 0 \\ 2 & 4 \end{bmatrix} \right| = 0$$

$$\begin{vmatrix} \lambda-4 & 0 \\ -2 & \lambda-4 \end{vmatrix} = 0$$

$$(\lambda-4)(\lambda-4) - 0 = 0$$

$$(\lambda-4)^2 = 0$$

(characteristic equation)

$$\lambda = 4, 4 \text{ (eigen values)}$$

(P.T.O)

For $\lambda = 4$

$$Ax = \lambda x$$

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

$$4x_1 = 4x_1$$

$$2x_1 + 4x_2 = 4x_2$$

$$\rightarrow 2x_1 = 4x_2 - 4x_2$$

$$2x_1 = 0$$

$$\boxed{x_1 = 0}$$

$$\text{Let } x_2 = t$$

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 0 \\ t \end{bmatrix} = t \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$\boxed{\text{basis } p_1 = \begin{bmatrix} 0 \\ 1 \end{bmatrix}}$$

$$\text{basis } p_2 = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$P = \begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$$

$$P^{-1} = ?$$

$$\text{det} = 0$$

inverse is not possible

To Find

$$P^{-1} A P$$