National University of Computer & Emerging Sciences, Karachi

School of Computing

Mid-1 Exam, Fall 2022

Friday,30th Sep.2022, 10:00 am – 11:00 am

| Course Code: MT-1004 | Course Name: Linear Algebra |
|---|---|
| Instructor(s): Dr.Khusro Mian , Mr.Jamil Usmani | |
| Student Roll No: | Section: |

Instructions:

- Return the question paper along with answer sheet. Scientific calculator is allowed.
- Read each question completely before answering it. There are 3 questions and 1 page.
- In case of any ambiguity, you may make assumption. But your assumption should not contradict any statement in the question paper.

**Time**: 60 minutes. **Max Marks**: 30 points

**Question 1 [CLO-1]** **Estimated Time: 15 minutes** **Marks (4+4)**

a) Suppose that the augmented matrix of linear system has been reduced by row operation to given row echelon form

$$A=\begin{bmatrix}1 & 0 & 8 & -5 & 6\\ 0 & 1 & 4 & -9 & 3\\ 0 & 0 & 1 & 1 & 2\end{bmatrix}$$

Is system Consistent? Write the parametric form of the system and discuss about free and basic variables.

b) Decide whether the matrix is invertible and if so, find the cofactors and use the adjoin method to find the inverse of matrix $B=\begin{bmatrix}2 & 0 & 3\\ 0 & 3 & 2\\ -2 & 0 & -4\end{bmatrix}$

**Question 2 [CLO-1]** **Estimated Time: 25 minutes** **Marks (6+6)**

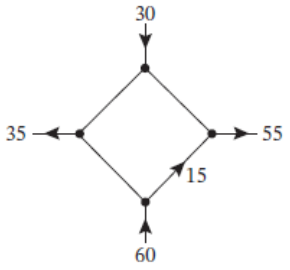
a) Solve the system using Cramer's rule $\begin{bmatrix}4 & 5 & 0\\ 11 & 1 & 2\\ 1 & 5 & 2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}=\begin{bmatrix}2\\ 3\\ 1\end{bmatrix}$

b) Solve Ax=b using Gauss elimination method, where $A=\begin{bmatrix}1 & 1 & 2\\ -1 & -2 & 3\\ 3 & -7 & 4\end{bmatrix}$, $b=\begin{bmatrix}8\\ 1\\ 10\end{bmatrix}$

**Question 3 [CLO-3]** **Estimated Time: 20 minutes** **Marks (7+3)**

a) The accompanying figure shows a network in which the flow rate and direction of flow in certain branches are known.

Find the flow rate and direction of flow in the remaining branches




b) Find the Standard matrix for the transformation T:$R^4 \rightarrow R^2$ defined by

$$w_1 = 2x_1 + 3x_2 - 5x_3 - x_4$$
$$w_2 = x_1 - 5x_2 + 2x_3 - 3x_4$$

Write domain and codomain and then compute T(1,-1,2,4)