National University of Computer & Emerging Sciences, Karachi
Fall-2023 Fast School of Computing
Mid-I Examination
28th September 2023, 08:30AM – 09:30AM

Course Code: MT1004	**Course Name: Linear Algebra**
Instructor(s) Name: Alishba Tariq, Fareeha Sultan, Dr. Khusro Mian, Mairaj Ahmed, Moheez ur Rahim, Shahid Ashraf, Usama Antuley,	
Student Roll No:	**Section No:**

Instructions:

- Attempt all questions. There are **03 Questions and 01 page**.
- Solve the paper according to the sequence given in the question paper.
- Graphical Calculator is not allowed.
- Return the question paper with the answer copy.

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

Question 01: **CLO-1** **[5+5]**

a) Using the given values for the $\boldsymbol{b's}$. solve the systems together by reducing an appropriate augmented matrix to reduced row echelon form.

$$-x_1 + 4x_2 + x_3 = b_1$$
$$x_1 + 9x_2 - 2x_3 = b_2$$
$$6x_1 + 4x_2 - 8x_3 = b_3$$

$i.\ b_1 = 0,\ b_2 = 1,\ b_3 = 0$ $ii.\ b_1 = -3,\ b_2 = 4,\ b_3 = -5$

b) Find the solution of the following system by computing the inverse of coefficient matrix using inversion algorithm$[A/I]$.

$$x + 3x + y = 4$$
$$2x + 2y + z = -1$$
$$2x + 3y + z = 3$$

Question 02: **CLO-2, 3** **[3+7]**

a) Find the standard matrix for the transformation $T: R^4 \rightarrow R^3$ defined by the linear system and then compute $T(1, -1, 2, 4)$ by matrix multiplication.

$$w_1 = 2x_1 - 3x_2 + x_3 - 5x_4$$
$$w_2 = 4x_1 + x_2 - 2x_3 + x_4$$
$$w_3 = 5x_1 - x_2 + 4x_3$$

b) Find the cubic polynomial whose graph passes through the points$(-1, -1)$, $(0, 1), (1, 3), (4, -1)$ by gauss Jordan elimination.

Question 03: **CLO-1** **[5+5]**

a) Evaluate determinant by cofactor expansion method.

$$\begin{bmatrix} 2 & 1 & 3 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & 2 & 1 & 0 \\ 0 & 1 & 2 & 3 \end{bmatrix}$$

b) Find the image of the vector $(3, -4)$ when it is rotated about the origin through an angle of $\theta = -60°$

i. Using matrix multiplication
ii. Describe the geometric transformation of image.

The End