National University of Computer and Emerging Sciences, Lahore Campus

Course:	Linear Algebra	Course Code:	MT1004
Program:	BS (CS, DS, SE)	Semester:	Fall 2021
Duration:	60 Minutes	Total Marks:	30
Paper Date:	19-Oct-21	Weight	12.5%
Section:	ALL	Page(s):	1
Exam:	Midterm-I	Roll No:	20L-1080

Instruction/Notes: **Programmable calculators are not allowed.**

Question # 1(a) [5]: Suppose three households in your neighborhood performed holy sacrifice this Eid. The 1st household sacrificed 2 cows, 4 lambs and 1 camel. The 2nd household sacrificed 1 cow, 3 lambs and 1 camel. The 3rd household sacrificed 3 cows, 5 lambs and 1 camel. If the first household spent total Rs. 9, 00, 000, second household spent Rs. 6,50,000 and third household spent Rs. 11,50,000. Use **Gauss Jordan Elimination** to determine how much each cow, lamb and camel cost?

Question # 1(b) [5]: Suppose that the **Augmented matrix** of a linear system of equations has been reduced by row operations to the given **Row Echelon** form. By inspection find the solution of the system from the given form.

$$\begin{bmatrix} 1 & 7 & -2 & 0 & -8 & -3 \\ 0 & 0 & 1 & 1 & 6 & 5 \\ 0 & 0 & 0 & 1 & 3 & 9 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

Question # 2 [10]: Determine condition(s) on $b_i's$, if any, in order to gurantee that the linear system is consistent

$$\begin{aligned} x_1 - 2x_2 - x_3 &= b_1 \\ 2x_1 + 5x_2 + 2x_3 &= b_2 \\ -3x_1 + 7x_2 + 4x_3 &= b_3 \end{aligned}$$

Question # 3 [6+4]: Use Inverse Algorithm (By Elementary Row Operations) to find the inverse of the matrix A. Also, express B as a product of the elementary matrices.

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 3 \\ 1 & 0 & 8 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 2 \\ 2 & 5 \end{bmatrix}$$