Sai University
Linear Algebra Test-1

NAME: **ROLL NO.:**

INSTRUCTIONS TO STUDENTS:

1. This examination is **90 minutes** in length and the maximum score is 20 marks.
2. **Please submit this question paper along with your answer sheet.**
3. Unless otherwise stated, please provide clear and complete justification for your answers.

ALL THE BEST!

1. (5 marks) Find the inverse of $A = \begin{pmatrix} 1 & 0 & -2 \\ -3 & 1 & 4 \\ 2 & -3 & 4 \end{pmatrix}$ if it exists.

2. (5 marks) Convert the following matrix to Reduced Row Echelon Form: $\begin{pmatrix} -8 & 6 & 1 & 0 \\ 4 & -9 & 5 & 0 \\ 4 & 3 & -6 & 0 \end{pmatrix}$

3. (3 marks) Write down the linear system you would solve in order to balance the following chemical equation (but do not solve it):

$$x_1 CO + x_2 CO_2 + x_3 H_2 \to x_4 CH_4 + x_5 H_2 O.$$

4. (2 marks) Write down the product matrix: $\begin{bmatrix} 1 & -2 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 2 & 0 \\ 0 & 1 & 3 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

5. (2 marks) Suppose the augmented matrix of a linear system is $\begin{bmatrix} 1 & 0 & 1 & 2 \\ 0 & 2 & 0 & 3 \\ 2 & 0 & 2 & 2 \end{bmatrix}$. How many solutions does the linear system have? Explain in brief.

6. (2 marks) Consider the linear system $B\mathbf{x} = \mathbf{v}$. Suppose B admits an LU decomposition. Then, solving the linear system $B\mathbf{x} = \mathbf{v}$ using LU decomposition involves solving which two triangular linear systems?

7. (1 mark) The following row operation is an elementary row operation (True/False)?

$$R_3 \mapsto R_2 - \frac{1}{2} R_3.$$

Note: No justification required, just write True or False as your answer.

*****END OF TEST*****