ISE 4623/5023: Deterministic Systems Models / Systems Optimization

University of Oklahoma

School of Industrial and Systems Engineering

Fall 2021

Individual Assignment 1 - Linear Algebra (100 points)

For each of the following problems, show the relevant work in addition to the final answer. Scan and submit the solution in a single PDF file.

Problem 1 (30 points):

Let $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1 \\ 2 & 3 \\ 4 & 2 \end{bmatrix}$

For each of the following, if the operation is possible, calculate it. If the operation is not possible, explain why.

a) (5 points) AB
b) (5 points) BA
c) (5 points) $-B$
d) (5 points) $A + 2B$
e) (5 points) A^T
f) (5 points) B^T

Problem 2 (30 points):

Use the Gauss-Jordan method to determine the solution to the following systems of equations. If the system of equations does not have a solution, explain why in detail. If the system of equations has more than a unique solution, explain why, and give a mathematical expression to describe all possible solutions.

a) (10 points)
$$3x_1 + x_2 = 2$$
$$-6x_1 - 2x_2 = -4$$

b) (10 points)
$$2x_1 + x_2 = 4$$
$$x_1 + 2x_2 = 5$$

c) (10 points)
$$2x_1 + x_2 = 4$$
$$-4x_1 - 2x_2 = 5$$

Problem 3 (40 points):

For each of the matrices below, calculate its inverse (by hand, using any method of your preference). If the matrix is not invertible, explain why in detail.

a) (10 points) $C = \begin{bmatrix} 1 & 2 \\ 4 & 2 \end{bmatrix}$

b) (10 points) $D = \begin{bmatrix} 2 & 4 \\ 4 & 8 \end{bmatrix}$

c) (10 points) $E = \begin{bmatrix} 1 & 2 & 4 \\ 4 & 2 & 6 \\ 5 & 4 & 10 \end{bmatrix}$

d) (10 points) $F = \begin{bmatrix} 1 & 2 & 4 \\ 4 & 2 & 6 \\ 5 & 4 & 8 \end{bmatrix}$