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EGN 3420 Exam 2A Name_____

SHOW ALL WORK

Problem 1 (40 pts)

Consider the following system of equations:

$$\begin{array}{rcrcrcrcrcr}
x_1 & + & x_2 & + & x_3 & - & 2x_4 & + & 2x_5 & = & 1 \\
2x_1 & - & x_2 & + & 3x_3 & - & 2x_4 & + & 2x_5 & = & 3 \\
3x_1 & & & - & 4x_3 & + & 4x_4 & - & 4x_5 & = & -4 \\
4x_1 & - & 3x_2 & & & + & 3x_4 & - & 3x_5 & = & 0 \\
x_1 & & & + & 3x_3 & - & 3x_4 & + & 3x_5 & = & 3
\end{array}$$

A) Transform the augmented matrix into Echelon Form.

$$\left(A\middle|\underline{b}\right) = \left[\begin{array}{ccccc|c} 1 & 1 & 1 & -2 & 2 & 1 \\ 2 & -1 & 3 & -2 & 2 & 3 \\ 3 & 0 & -4 & 4 & -4 & -4 \\ 4 & -3 & 0 & 3 & -3 & 0 \\ 1 & 0 & 3 & -3 & 3 & 3 \end{array}\right] \approx$$

Which of the following statements are true?

The equations are inconsistent.

The equations are consistent and there is a unique solution.

The equations are consistent and there is 1 arbitrary unknown.

The equations are consistent and there are 2 arbitrary unknowns.

B) If the equations are consistent and there is a unique solution, find it.

If the equations are consistent and there is 1 arbitrary unknown, determine if x_1 can be arbitrary without solving for it.

If the equations are consistent and there are 2 arbitrary unknowns, determine if x_1 can be one of the arbitrary unknowns without solving for it.

C) If the equations are consistent and there are one or more arbitrary unknowns, express the solution in terms of the arbitrary unknown(s).

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Problem 2 (30 pts)

Find the equation of the Least Squares line which best fits the quadratic $y = x^2 + 1$ over the interval (0,5). Do this by generating 6 equally spaced points over the interval (0,5) from the quadratic.

i	x_i	$y_i = x_i^2 + 1$
1	0	1.0000
2	1	
3	2	
4	3	
5	4	
6	5	

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Problem 3 (30 pts)

Consider the definite integral $I = \int_0^1 e^{-2x}\,dx$.

A) Use Trapezoidal integration with n=5 intervals to approximate I.

B) Find the truncation error.

Round all calculations to 5 places after the decimal point.

i	x_i	$f_i = e^{-2x_i}$
0		
1		
2		
3		
4		
5		