Name _____

ENGR 104, Exam 2, examples

**** Return all the pages when you are done. For Part I, directly write on the paper. For Part II, send the published .html file with the results to homeworkflc02@gmail.com.**

PART I

Complete these problems by hand – DO NOT USE MATLAB TO ANSWER.

1. For the set of matrices indicate whether they can be multiplied together (in the orders indicated) using element-by-element multiplication, matrix multiplication, or both. (**5 pts each**)

$$A = \begin{bmatrix} 2 & 5 \\ 2 & 9 \\ 6 & 5 \end{bmatrix} \qquad B = \begin{bmatrix} 0 & 5 \\ 2 & 0 \end{bmatrix}$$

[A] x [B]	Yes	No
Element-by –Element:	_____	_____
Matrix Multiplication:	_____	_____

[B] x [A]	Yes	No
Element-by –Element:	_____	_____
Matrix Multiplication:	_____	_____

2. Calculate the indicated operations on A and B:

(a) A.*B **(5 pts)**

$$A = \begin{bmatrix} 2 & 2 \\ 1 & 4 \end{bmatrix} \qquad B = \begin{bmatrix} 2 & 3 \\ 3 & 2 \end{bmatrix} \qquad A .* B = \begin{bmatrix} \_\_ & \_\_ \\ \_\_ & \_\_ \end{bmatrix}$$

(b) **B + A** **(5 pts)**

$$A = \begin{bmatrix} 2 & 2 \\ 1 & 4 \end{bmatrix} \qquad B = \begin{bmatrix} 2 & 3 \\ 3 & 2 \end{bmatrix} \qquad B + A = \begin{bmatrix} \_\_ & \_\_ \\ \_\_ & \_\_ \end{bmatrix}$$

(c) **A*B** **(5 pts)**

$$A = \begin{bmatrix} 2 & 2 \\ 1 & 4 \end{bmatrix} \qquad B = \begin{bmatrix} 2 & 3 \\ 3 & 2 \end{bmatrix} \qquad A * B = \begin{bmatrix} \_\_ & \_\_ \\ \_\_ & \_\_ \end{bmatrix}$$

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PART II

Use MATLAB to complete problems 3-6. Your script files will be graded on following the format outlined in class, and used in your homework assignments, e.g. use of cell delimiters and adequate comments. Save your scripts regularly so you don't accidentally lose your work if you bump a power button.

When you are done:

- Publish your script file. Make sure it runs and shows all results.
- Send it to the homework email.

3. The equations below represent a typical electrical circuit with two voltage sources connected to five resistors with three closed loops.

$$i_1 R_1 + (i_1 - i_2) R_4 = V_1$$
$$i_2 R_2 + (i_2 - i_3) R_5 + (i_2 - i_1) R_4 = 0$$
$$i_3 R_3 + (i_3 - i_2) R_5 = -V_2$$

Where:
$R_1 = 50\ \Omega$; $R_2 = 50\ \Omega$; $R_3 = 100\ \Omega$; $R_4 = 125\ \Omega$; $R_5 = 350\ \Omega$;
$V_1 = 24$ volts; $V_2 = 10$ volts;

Put the equations into matrix form and **solve for the unknown currents i_1 through i_3**. Create variables for the known Rs and Vs then contruct the matrices in terms of those variables. Display the results using fprintf (doesn't have to be a single fprintf). Since you are on a deadline don't use time typing the equations into the problem. **(35 pts)**

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4. Enter this array, C:

$$C = \begin{bmatrix} 1 & 4 & 2 \\ 2 & 4 & 100 \\ 7 & 9 & 7 \\ -3 & 5 & 1 \end{bmatrix}$$

a) Extract the sub-matrix in the box shown below and assign the sub-matrix to matrix B: **(9 points)**

$$C = \begin{bmatrix} 1 & 4 & 2 \\ 2 & \boxed{\begin{matrix} 4 & 100 \\ 9 & 7 \end{matrix}} \\ 7 & \\ -3 & 5 & 1 \end{bmatrix}$$

b) Find the maximum and the average value of the entire matrix. **(9 points)**

c) Extract the first row of C and assign it to C1. Replace any numbers that are >3 in C1 to 0 using logical operations. **(9 points)**

d) Use Nested For Loops to scan every element of the matrix and detect if there is any '100' in the matrix. If there is any '100' in the matrix, replace it to '0'. Use the fprintf () function to report how many '100' you detected in the matrix. **(9 points)**

e) Generate a 100-pixel by 100-pixel map, assign 0's to all the pixels. Put three layers of this map together in one map and plot this merged map in Matlab. Given that '255' represents the 'white' color in an RGB map, can you make a RGB map has the regions shown in the following figure being filled with white pixels but all other regions are still black? **(9 points)**