EXAM 2 – WRITTEN PORTION

NAME _____

SECTION NUMBER _____

CAMPUS MAILBOX NUMBER _____

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Written Portion	/ 40
Computer Portion	/ 60
Total	/ 100

USE MATLAB SYNTAX FOR ALL PROGRAMS AND COMMANDS YOU WRITE

Problem 1:

(4 points) For the code scrap shown below, what is in `sequence` after the code runs?

```
clc
clear variables
row=1;
for object1=1:2
    for object2=1:2
        if (object1 ~= object2)
            sequence(row,1)=object1;
            sequence(row,2)=object2;
            row=row+1;
        end
    end
end
```

a) `sequence`= $\begin{bmatrix}1 & 2\\ 2 & 1\end{bmatrix}$

b) `sequence`= $\begin{bmatrix}2 & 1\\ 1 & 2\end{bmatrix}$

c) `sequence`= $\begin{bmatrix}1 & 1\\ 2 & 2\end{bmatrix}$

d) `sequence`= $\begin{bmatrix}1 & 1\\ 2 & 1\\ 1 & 2\\ 2 & 2\end{bmatrix}$

e) `sequence`= $\begin{bmatrix}1 & 2 & 1 & 2\\ 1 & 1 & 2 & 2\end{bmatrix}$

f) other (give the matrix):_____

g) the matrix is empty

h) the program gives an error (explain):_____

Problem 2:
(4 points) Consider the main routine and function shown below. When we run the main routine, what will print to the command window?

```
clc
clear variables
a=2;
b=1;
[answer] = a_function(a,b);
fprintf('answer=%2i\n',answer)


function [c] = a_function(e,f)
c=e+2*f;
```

a) answer= 4

b) answer= 5

c) other (specify):_____

d) the program will give an error (explain):_____

Problem 3:
(4 points) The following line creates a 3 x 3 matrix in MATLAB

A = [1 1 1;1 1 1;1 1 1];

The following loop will change the matrix A. What is in A after the code runs?

```
for i = 1:1:3
    for j = 1:2:3
        A(i,j) = i + 2*j;
    end
end
```

a) $\begin{bmatrix} 3 & 5 & 7 \\ 4 & 6 & 8 \\ 5 & 7 & 9 \end{bmatrix}$

b) $\begin{bmatrix} 3 & 1 & 7 \\ 4 & 1 & 8 \\ 5 & 1 & 9 \end{bmatrix}$

c) $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$

d) $\begin{bmatrix} 3 & 4 & 5 \\ 1 & 1 & 1 \\ 7 & 8 & 9 \end{bmatrix}$

e) $\begin{bmatrix} 3 & 4 & 5 \\ 5 & 6 & 7 \\ 7 & 8 & 9 \end{bmatrix}$

f) None of the above (explain):

Problem 4:
(4 points) Consider the main routine and function shown below. When we run the main routine, what will print to the command window?

```
clc
clear variables
a=1;
b=2;
another_function(a,b);
fprintf('c=%2i\n',c)


function [] = another_function(a,b)
c=a+2*b;
```

a) c= 4

b) c= 5

c) other (specify):_____

d) the program will give an error (explain):_____

Problem 5:
(4 points) What will the value of `xVal` be at the end of the following code?

```
xVal = 2;
yVal = xVal;

while (xVal > 6) | (yVal <= 10)
    xVal = xVal+2;
    yVal = yVal*xVal;
end
```

a) 2

b) 4

c) 6

d) 8

e) None of the above (explain):_____

Problem 6:
(4 points) A main code and a simple function have been written below. When we run the main routine, what will print to the command window?

```
a = 1;
b = 2;
n = 2;
[a_plus_b] = find_value_function(a,b,n);


function [a_plus_b] = find_value_function(a,b,num_loops)
for i = 1:num_loops
    a = a + i;
    b = b + 1;
end
```

a) 3

b) 7

c) 4

d) 11

e) None of the above (explain):_____

Problem 7:
(4 points) What is the value of x after the following program executes?

```
x = 0;
for i = 1:4
    switch i
        case 1
            x = x + 1;
        case 2
            x = 2 * x;
        otherwise
            x = x + 3;
    end
end
```

a. x = 0

b. x = 1

c. x = 2

d. x = 5

e. the program crashes

f. none of the above (explain):_____

Problem 8:

(4 points) A main code and a function have been written below:

```
var = 4;
finish = 10;
[total] = simple_function(finish, var)


function [answer] = simple_function(a, b)
answer = 0;
while (b > 0.5) & (answer < a)
    b = 0.5 * b;
    answer = answer + 1;
end
```

i. After we run the main code, what is the value of 'answer' in Matlab's workspace?

a) answer = 1

b) answer = 2

c) answer = 3

d) none of the above: explain_____

ii. After we run the main code, what is the value of 'total' in Matlab's workspace?

a) total = 1

b) total = 2

c) total = 3

d) none of the above: explain_____

Problem 9:
(4 points) You are given a 3 x 3 matrix called A:

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

Write a short program using for loop to generate another matrix B which is a mirror image of A.

$$B = \begin{bmatrix} 3 & 2 & 1 \\ 6 & 5 & 4 \\ 9 & 8 & 7 \end{bmatrix}$$

You do not need to print out the answer.

Problem 10:

(4 points) Consider the main routine and function shown below. When we run the main routine, what will print?

```
clc
clear variables
a=1;
b=2;
c=3;
[answer] = some_function(a,b,c);
fprintf('answer=%2i\n',answer)


function [w] = some_function(b,a,c)
w=a+2*b+3*c;
```

a) answer=15

b) answer=13

c) other (specify):_____

d) the program will give an error (explain):_____

EXAM 2 – Computer PORTION

Note special instructions: ***Put all of your files for this exam in a folder named "LastName_FirstName".***

- Download the following files from courseware page and put them in the folder
  - Excel spreadsheet named "`Obstacle_Data.xls`"
  - Function "`get_obstacles.m`."
- Create your files in this folder too
  - "`Main.m`"
  - Function "`distance.m`"
  - Function "`get_min_dist.m`"

At the end of the exam copy your *entire folder* to the DFS directory (see instructions at end of exam).

Problem (60 pts)

The function `get_obstacles.m`. reads the data file `Obstacle_Data.xls` and passes back two vectors, the first containing the x-components of all obstacles, and the second containing the corresponding y-components.

a) (10points) Write a main routine ("`Main.m`") that calls the function `get_obstacles` and then plots the objects with red dots. (Recall that you would use `'r.'` with the plot command to make red dots). Set the axis to run from -10 to 100 in x and in y.

b) (15 Points) Create a function whose name is "`distance`". The function must have 4 inputs: the x-coordinate of the first point, the y-coordinate of the first point, the x-coordinate of the second point, and then the y-coordinate of the second point. It must have a single output: the distance between the points.

c) (25 points) Create a function whose name is "`get_min_dist`". This function must have 4 inputs: the x-coordinate of a reference point, the y-coordinate of a reference point, the vector of x-coordinates of all obstacles, and then the vector of y-coordinates of all obstacles. The function `get_min_dist` must have two outputs: the x and y coordinates of the obstacle which is closest to the reference point. This function must call your distance function from part (b).

d) (10 pts) Put the command `hold on` in your file. Add a line to your obstacle plot which runs from (0,0) to the obstacle which is closest to (0,0). You must use your function from part (c) to get the coordinates of the correct obstacle.

When you are done, post *your entire folder* to DFS:

1. Double-click on "Documents" on your desktop.
2. Double-click on "DFS Root" on the left column.
3. Double-click on AcademicAffairs.
4. Double-click on ME.
5. Double-click on ME123.
6. Double-click on Exams.
7. Double-click on the folder with your section number.
8. Copy and paste *your entire folder* to this folder.

NOTE: All programming must stop at 8:30 pm. You will have a few minutes after that to post your file if you need that time.