

EXAM 2 – WRITTEN PORTION

NAME _____

SECTION NUMBER _____

CAMPUS MAILBOX NUMBER _____

EMAIL ADDRESS _____@rose-hulman.edu

Written Problem	/ 40
Coding Problem	/ 60
Total	/ 100

USE MATLAB SYNTAX FOR ALL PROGRAMS AND COMMANDS YOU WRITE

Problem 1:

(4 points) Given this following piece of code, what will the value of z be at the end of the code?

```
x=2;  
y=8;  
z=0;  
for i=1:3  
    if (i < x*2)  
        z=x*y-i;  
    elseif (i < y/2)  
        z=y/x-i;  
    elseif (i == 3)  
        z=x+y-i;  
    end  
end
```

- a) z=1
- b) z=7
- c) z=13
- d) z=0
- e) none of the above _____

Problem 2:

(4 points) What is wrong with the following program? Indicate the necessary changes to make it work.

```
a = 3;  
b = 2;  
c = 5;  
for x = 0:0.1:1.0  
    yvector(x) = a*x^2 + b*x + c;  
end
```

Problem 3:

(4 points) For the following code, what will print at the end of the code?

```
a=1;
b=2;
c=3;
d=4;

if (a>b) & (c<d)
    e=a+b+c+d;
elseif (a>b) | (c>d)
    e=a*b*c*d;
end
fprintf('e = %2i \n',e);
```

- a) e = 0
- b) e = 10
- c) e = 24
- d) nothing will print, because there will be an error
- e) none of the above _____

Problem 4:

(4 points) We have written a simple function and a main routine that calls that function:

```
a=1;
b=2;
c=3;
answer=simplefunc(a,b,c);

function answer=simplefunc(c,b,a);
answer=a*b+c;
```

After we run the main routine, we would expect that the value of 'answer' is

- (a) 5
- (b) 7
- (c) Other: answer=_____ (Explain)
- (d) The program will not run-- it will crash.

Problem 5:

(4 points) Suppose that we intended to print a list of all of the numbers whose cubes are less than 100. Our first attempt at this code was

```
clc
clear variables
n=1;
while (ncubed < 100)
    fprintf(' ncubed = %2i \n',ncubed)
    n=n+1;
    ncubed=n*n*n;
end
```

However, when we try to run this code we get the error message

```
??? Undefined function or variable 'ncubed'.
```

```
Error in ==> exam2_mc at 5
while (ncubed < 100)
```

Mark the correction that we need to make to the original code so that it will run correctly. (Do not change the while loop to a for loop, though-- we want you to retain the while loop.)

Problem 6:

(4 points) We wrote a scrap of code to compute the sum of integers and the product of integers, for all those integers for which the product is less than 100:

```
clc
clear variables
i=1;
sum=0;
product=0;
while product < 100
    i=i+1;
    sum=sum+i;
    product=product*i;
end
```

However, the program just runs forever. (It is in an infinite loop.) Find the error in the code and mark the change on the listing above. (Do not change the while loop to a for loop.)

Problem 7:

(4 points) We wrote a code that finds the position of a ball dropped from 100 meters up. The code is supposed to finish when the position of the ball is less than zero (the ball "hits" the ground):

```
clc
clear variables
i=1;
v(1)=0;
y(1)=100;
g=9.81;
dt=0.1;
while y(i) > 0
    v(i+1) = v(i) - g*dt;
    y(i+1) = y(i) + v(i)*dt;
    _____
end
```

Unfortunately, the code runs forever because there is a line missing inside the while loop. Fill in the missing line so that the code terminates properly.

Problem 8:

(4 points) What is the value of total after the following program runs?

```
B = [1;2;3;4;5;6;7;8;9];

total = 0;
row = 1;
for i=1:3
    total = total + B(row);
    row = row + 2;
end
```

- a) 45
- b) 25
- c) 4
- d) 9
- e) None of the above

Problem 9:

(4 points) In the generically-sized tables below, write out the arrays that result from the following code:

```
for i = 1:4
    xvector(i,1) = i;
    yvector(i,2) = i;
end
```

Write out xvector in the table on the left and yvector in the table on the right:

Problem 10:

(4 points) The line of code shown here:

```
A = [1,9,3,6; 2,5,5,2; 4,1,6,7; -3,-4,2,7];
```

... creates the 4 x 4 matrix A shown here:

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

Write a short program that will overwrite the fourth column of A with the numbers 2,4,6,8.

EXAM 2 – Computer PORTION

Put all of your code into three m-files and name them: `lastname_firstname.m`,
`lastname_firstname_function_a.m`, `lastname_firstname_function_b.m`, (all lower case).

Include your name, section number, and CM number in the header section of your code. There should be no output other than what is requested.

Problem (60 pts)

Download the Excel spreadsheet named “grade.xls” from the course web page at
<http://www.rose-hulman.edu/ME123/courseware.shtml>

It contains a large grade sheet for a freshman course. The number of columns on the spreadsheet is known, but the number of students (the number of rows in the spreadsheet) may vary. (Use MATLAB to determine the size of the sheet – do not hard code the information in the program.) The columns in the grade sheet can be summarized by the following table:

Column Number	Contents
1	Student ID number
2 – 10	Homework scores (percentage)
11 – 14	Exam scores (percentage)

According to the course policy, the total course grade is computed based on the following formula:

$$\text{Total course score} = 0.20 \times \text{Homework Average} + 0.80 \times \text{Exam Average}$$

where “average” represents the arithmetic mean of all reported scores in the respective category.

Write a MATLAB code to

- a) Read in the data stored in the Excel spreadsheet. Determine the total number of students recorded on the data sheet and print it to the screen (command window) using the following format:

```
The total number of students in the course is xxxxx.
```

- b) Do not hard code your result for Part a) anywhere in your code. Write a function to compute the total course score for each student. The function call should be:

```
student_scores = lastname_firstname_function_a(grade_sheet)
```

where “student_scores” is a single vector containing one (total course score) value for each student and “grade_sheet” is the array containing the spreadsheet data. To show that your function is working correctly, have the main program print the total course score for just the first student to the screen using the following format:

```
The total course score for the first student is xxx percent.
```

- c) Based on the total course score computed in Part a), we wish to assign a grade to each student according to the following scheme:

Total Course Score x	Grade
$90\% \leq x \leq 100\%$	A
$80\% \leq x < 90\%$	B
$70\% \leq x < 80\%$	C
$60\% \leq x < 70\%$	D
$x < 60\%$	F

Write a function to assign a grade to each student and count the total number of students who received each letter grade. The function call should be:

```
grade_count = lastname_firstname_function_b(student_scores)
```

where “grade_count” is a column vector containing the number of students receiving A’s, B’s, C’s, D’s, and F’s. “student_scores” is the vector from Part b).

In the main program (master), print the number of students receiving each grade to the screen (command window) using the following format:

```

      A      B      C      D      F
     XXX     XXX     XXX     XXX     XXX

```

When you are done, post your m-file answer to the correct folder:

1. Double-click on “My Network Places”. If it is not on your desktop, look in your start menu.
2. Double-click on “[DFS] Root”. *Not [AFS] Root.*
3. Log in with your email address and password.
4. Double-click on Academic Affairs.
5. Double-click on ME.
6. Double-click on ME123.
7. Double-click on Exams.
8. Double-click on the folder with your section number.
9. Copy and paste your three m-files to this folder.