EXAM 1 – WRITTEN PORTION

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Written Portion	/ 52
Computer Portion	/ 48
Total	/ 100

USE MATLAB SYNTAX FOR ALL PROGRAMS AND COMMANDS YOU WRITE.

Problem 1: (4 points) What prints to the command window when we run the following script?

```
clc
clear variables
close all

x = 4;
y = 4;

if x > y
    fprintf('x is greater than y \n')
elseif x <= y
    fprintf('x is less than or equal to y \n')
elseif x == y
    fprintf('x is equal to y \n')
end
```

a. x is greater than y
b. x is less than or equal to y
c. x is equal to y
d. x is less than or equal to y
   x is equal to y
e. Nothing prints
f. The program crashes
g. Other (explain): _____

Problem 2: (8 points) You are given a matrix called `xy_data` and a column vector called `z_data`, as shown below. Write a short program using a `for` loop that creates the matrix called `xyz_data` (also shown below) by combining the data in `xy_data` and `z_data`.

$$\texttt{xy\_data} = \begin{bmatrix} 2 & 6 \\ 12 & 19 \\ 24 & 27 \\ 34 & 39 \end{bmatrix} \qquad \texttt{z\_data} = \begin{bmatrix} 9 \\ 17 \\ 23 \\ 35 \end{bmatrix} \qquad \texttt{xyz\_data} = \begin{bmatrix} 2 & 6 & 9 \\ 12 & 19 & 17 \\ 24 & 27 & 23 \\ 34 & 39 & 35 \end{bmatrix}$$

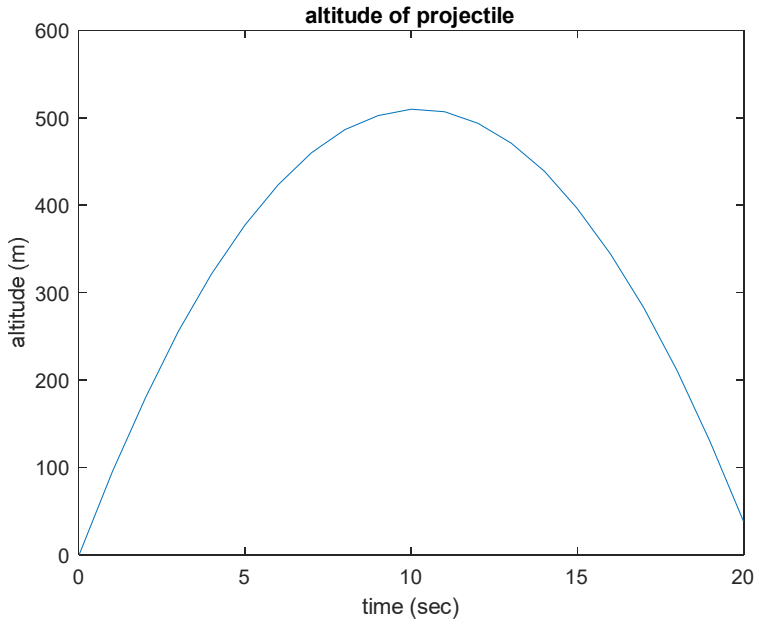
Problem 3: (4 Points) What is `a` after the following code runs?

```
clc
clear variables

a = 2;
for b = 3:-1:0
    if b > 2
        a = 5*b;
    elseif b == 2
        c = 7;
    else
        a = b + c;
    end
end
```

a. 2
b. 7
c. 8
d. 9
e. 15
f. The program crashes
g. Other (explain): _____

Problem 4: (4 points) The program below is supposed to plot the altitude of a projectile as a function of time, as shown in the plot. Complete the program by filling in the blanks so that it runs correctly.




```
clc
clear variables
close all

v0 = 100;   % m/sec
g = 9.81;   % m/sec^2

_________________________

for t = 0:1:20

    time(_________) = t;

    y(________) = v0*t - 1/2*g*t^2;

    _________________________

end


plot(time,y)
title('altitude of projectile')
xlabel('time (sec)')
ylabel('altitude (m)')
```

Problem 5: (8 points) Write a short program to create the matrix shown below. Notice that the values of each entry in the matrix are given by the equation $C_{ij} = \mathrm{i} * \mathrm{j}$

$$C = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 2 & 4 & 6 & 8 & 10 & 12 \\ 3 & 6 & 9 & 12 & 15 & 18 \end{bmatrix}$$

Problem 6: (8 points) The program below is supposed to plot the following function from $\theta = 0$ to 4π:

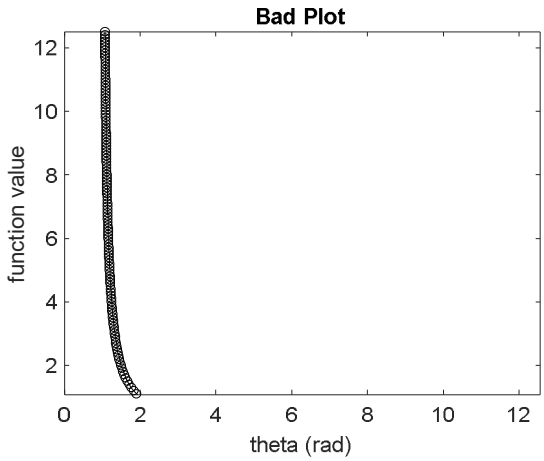
$$f(\theta) = \frac{\cos(\theta - \pi/2)}{\theta + 1}$$

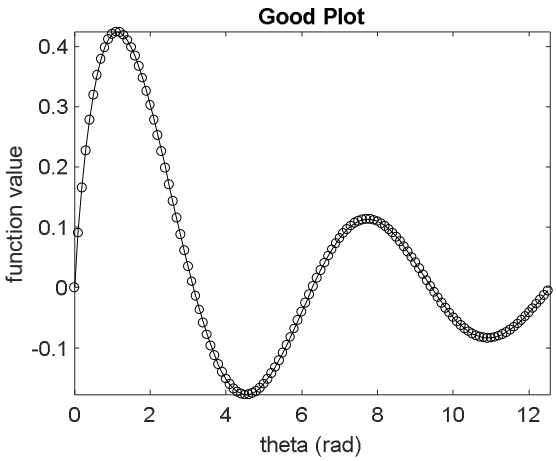
The program runs without errors. However, the resultant plot ("Bad Plot") is incorrect. Fix the code so that it makes the correct plot ("Good Plot"). **Make only the changes that are necessary to fix the code so it produces the "Good Plot".** Do not make extraneous (unnecessary) changes.

```
clc
clear variables
close all

k = 1;
for theta = 0:0.1:4*pi
    f(k) = cosd(theta - pi/2)/theta+1;
    angle(k) = theta;
    k = k+1;
end

plot(f,angle,'ko-')
xlabel('theta (rad)')
ylabel('function value')
axis([0 4*pi min(f) max(f)])
title('Bad Plot')
```





Problem 7: (4 points) What are the values of `cat` and `dog` after we run the code below?

```
clc
clear variables
close all

cat = 1;
dog = 5;

while ((cat<=dog) && (dog>=3))
    cat = cat + 1;
    dog = dog - 1;
end
```

Problem 8: (4 points) The code below is supposed to create vector called `my_vector` that contains integers between 5 and -5. However, the error shown below occurs and the vector is not created. **Explain** why the error occurred and **fix** the code so that it creates the correct vector.

```
Command Window
  Subscript indices must either be real positive integers or logicals.

  Error in vector_indexing_error_problem (line 7)
      my_vector(x) = x;
```

```
clc

clear variables

close all


for x = 5:-1:-5


    my_vector(x) = x;


end
```

Problem 9: (4 points) You are given a matrix called `R`,

$$R = \begin{bmatrix} 3 & 2 \\ 7 & 1 \\ 9 & 5 \end{bmatrix}$$

and the following code segment:

```
[m,n] = size(R);
for k = 1:m
    R(k,1) = R(k,2)*R(k,1);
end
```

What is `R` after the code is executed? If you think the code will produce an error and not run, write an "X" in the space below.

Problem 10: (4 points) You want to print a table of numbers that has five columns and three rows using a single `fprintf` command. The table of numbers is stored in MATLAB as a matrix called `M`, which also has five columns and three rows. Which of the following commands will print the table correctly?

a. `fprintf('%2.0f %2.0f %2.0f %2.0f %2.0f \n', M');`

b. `fprintf('%2.0f %2.0f %2.0f %2.0f %2.0f \n', M);`

c. `fprintf('%2.0f %2.0f %2.0f \n', M');`

d. `fprintf('%2.0f %2.0f %2.0f \n', M);`

e. None of the above will work.

f. Other (explain): _____