An-Najah National University  
Faculty of Engineering  
Mechanical Engineering Department  
Computer Apps. in Mechanical Eng.  
First Exam

Instructor Name: Dr. Nidal Farhat  
Student Name: Solution
Academic Year: Fall 2014/2015  
Registration Number: ..........  
Credit Hours: 3  
Total Exam Mark: 77  
Date: Thursday, September 25, 2014  
Exam Duration: 50 min  
Exam Weight: 20

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<td>Q2</td>
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<td>Q3</td>
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**Student Grade**

*Exam Notes:*

1. Solve all the problems.
2. Closed books and notes.
3. Read each problem carefully before attempting to solve it.
4. Write all work on this exam paper.
Question 1: evaluations: (32 points)

- What is the output/function of the following statements in MatLab. If an error is found explain why?

1) \( x = \text{eye}(2,3); \ x(3,2) = 10; \)
\[
X = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 10 & 0 \end{bmatrix}
\]

2) \( x = \text{ceil}(\text{rand}(2,3)); \ x = x(2,3) \)
\[
X = \begin{bmatrix} \frac{1}{2} & 1 \\ 1 & 1 \end{bmatrix} \rightarrow X = 1
\]

3) \( x = \text{int2str}(0.5) \)
\[
x = '1' \quad \text{(string)}
\]

4) \( x = \text{ones}(2,3); \ x = x(3,2) \)
\[
\text{error index exceed matrix dimension}
\]

5) \( x = \text{atan2}(-5,-5) \)
\[
x = \angle 135
\]

6) \( x = [2 \ 7 \ 5 \ 6; \ 4 \ 3 \ 11 \ 12]; \ x = [ [ x(2,:); \ x(1,:); \ x(1:2,1:2) ] ] \)
\[
X = \begin{bmatrix} 2 & 7 & 5 & 6 \\ 4 & 3 & 11 & 12 \end{bmatrix} \rightarrow X = \begin{bmatrix} 2 & 5 & 6 & 7 & 3 \\ 4 & 3 & 11 & 12 & 4 \end{bmatrix}
\]

7) \( x = [2 \ 7 \ 5 \ 6; \ 4 \ 3 \ 11 \ 12]; \ x = x(:,) \)
\[
X = \begin{bmatrix} 2 & 7 & 5 & 6 \\ 4 & 3 & 11 & 12 \end{bmatrix} \rightarrow X = \begin{bmatrix} 2 \\ 4 \\ 7 \\ 12 \end{bmatrix}
\]
8) a = 5; b = 5; disp(a,b)

Error: disp function has only one input

---

**Question 2: 12 points**

Mention two differences between:
1) `lookfor` and `help` commands.

<table>
<thead>
<tr>
<th>Look for</th>
<th>Help</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Search for a word in the first command line of all the functions in MATLAB</td>
<td></td>
</tr>
<tr>
<td>- Gives 'displays' the first command line if the word is found</td>
<td></td>
</tr>
<tr>
<td>- Gives the help 'information' about the requested function</td>
<td></td>
</tr>
<tr>
<td>- Displays all the commands in the function before the first executable line</td>
<td></td>
</tr>
</tbody>
</table>

2) `save myname` and `save myname -ascii`

<table>
<thead>
<tr>
<th>Save myname</th>
<th>Save myname -ascii</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saves all the data in the U.S. in MATLAB format, a file that can be only retrieved by MATLAB program</td>
<td></td>
</tr>
<tr>
<td>Saves all the information about the variables' names, size, type, value</td>
<td></td>
</tr>
<tr>
<td>Save - in ASCII format that can be retrieved by Windows applications</td>
<td></td>
</tr>
<tr>
<td>Saves only the value</td>
<td></td>
</tr>
</tbody>
</table>
Question 3: 33 points.

Recall that projectile motion is defined by the relations:

\[ x = x_0 + V_{0x} \cdot t \]
\[ y = y_0 + V_{0y} \cdot t + 0.5 \cdot a \cdot t^2 \]

where: \( V_{0x} = V_0 \cdot \cos(\theta) \quad V_{0y} = V_0 \cdot \sin(\theta) \) (where \( \theta \) in radians)

Given:

1) \( V_0 = 80 \text{ m/s} \)
2) \( \theta = 30^\circ \)
3) \( a = -9.81 \text{ m/s}^2 \)
4) \( x_0 = 0 \) and \( y_0 = 0 \)
5) the time (t) varies from 0 to 4 with a step of 0.1 seconds.

a) Create a MatLab program that sketches the position of the particle in the plane according to the previous conditions

b) Find the maximum height of the particle (show the value on the command window)

c) At what time and x-position the maximum height take place? (show these values on the command window)
clc; clear; close
% 5 points
t = 0:0.1:4;
V0 = 80;
theta = 30;
X0 = 0;
Y0 = 0;
a = -9.81;
% 5 points (3 + 2 for degree transformation)
V0x = V0*cosd(theta);
V0y = V0*sind(theta);
% 7 points (4+3 for the . operation)
X = X0 + V0x*t;
Y = Y0 + V0y*t + 0.5*a*t.^2;
% 4 points
plot(X,Y)
% 5 points (3 Ymax and 2 Loc)
[Ymax,Loc] = max(Y);
% 7 points (3 disp and 4 t(Loc) and X(Loc))
disp(Ymax)
disp(t(Loc))
disp(X(Loc))