



Mechanical Engineering Department
The University of Jordan
Final Exam: Computer Programming for Engineers (0934202)
Spring 2014.

Name: ----- **ID#:**----- **Serial#:**-----

Instructions: There are 4 problems. The first problem is Multiple Choice Questions (31 questions). Please, for the Multiple Choice Questions, *circle your answer in the table provided on the first page*. The exam is 90 minutes.

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Prob. 1[32 points] Choose the most correct answer. Consider each problem as a new one. Assume that you execute a clear command before each problem. What is the output from MATLAB for if the following lines are typed in MATLAB command screen?

Q1. >> A = [2 -4 10 13; 16 3 -7 18; 8 4 9 -25];
>> x = max(A)

a) 13 18 9	b) 13 18 9	c) 13 10 2 -4 18 16 3 -7 9 8 4 -25
d) No output, just a new >> prompt		e) 16 4 10 18

Q2. >> x = fminbnd('cos', 0,4)

a) 3.1416	b) 1.5708	c) 180
d) MATLAB would print an error message		e) pi

Q3. >> x = 8/2; x = x .* ans

a) 4	b) 16	c) x = x * x
d) MATLAB would print an error message		e) None of the above.

Q4. To solve the polynomial $x^3-7x^2+34=0$

a) solve[1 -7 34]	b) solve([1 -7 0 34])	c) root([1 -7 0 34])
d) solve (x ³ - 7x ² + 34 = 0)		e) roots([1 -7 0 34])

Q5. If the polynomials a = 3x²+4 and b=2x+5. To evaluate x = a divide by b

a) a=[3,0,4]; b=[2,5]; x = a/b	b) a=[3,0,4]; b=[2,5]; x = a./b	c) a=[3,0,4]; b=[2,5]; x = a\b
d) a=[3,0,4]; b=[2,5]; x = deconv(a,b)		e) a=[3,0,4]; b=[2,5]; x = dev(a,b)

Q6. >> A = [2 -4 10 13; 16 3 -7 18; 8 4 9 -25];
>> x = A(2:3, 1:3)

a) MATLAB would print an error message	b) -4 10 3 -7 4 9	c) 3 -7 18 4 9 -25
d) 16 3 -7 8 4 9		e) 2 3 , 1 2 3

Q7. >> x=[-1, -3.4,4]
>> diff(x)

a) MATLAB would print an error message	b) 2.0 -7.4	c) 3.4 3.0
d) -2.40 7.4		e) New Prompt.

Q8. >> x=[-1, -3.4, 4]
>> diff(x)/5 ;

a) -0.48 -1.48	b) -0.48 1.48	c) 0.48 1.48
d) MATLAB would print an error message		e) New Prompt .

Q9. >> x=[3,2,0,7]; y=[1,2,3,3];
>> diff(x)./diff(y)

a) -2.40 7.4	b) 2.0 -7.4	c) 3.4 3.0
d) MATLAB would print an error message		e) -1 -2 Inf

Q10. >> p=[10 0 2 5]
>> b=polyder(p)

a) -10 2 3	b) 30 2 0	c) 30 0 2
d) MATLAB would print an error message		e) New Prompt .

Q11. >> syms n r
>> diff(n^r,n)

a) New prompt .	b) $n^r \cdot \log(n)$	c) $n^{(r-1)}$
d) MATLAB would print an error message		e) $n^{(r-1)} \cdot r$

Q12. >> syms n r
>> diff(r*sin(n))

a) $r \cdot \cos(n)$	b) $\sin(n)$	c) $\cos(n)$
d) MATLAB would print an error message		e) $-\cos(n)$

Q13. >> syms n r
>> diff(r*sin(n),n,2)

a) $r \cdot \cos(n)$	b) $-r \cdot \sin(n)$	c) $-r \cdot \cos(n)$
d) MATLAB would print an error message		e) $r \cdot \sin(n)$

Q14. >> syms x y
>> int(sin(x),0,pi)

a) 0	b) 2	c) -2
d) 1		e) -1

Q15. >> dsolve('Dy=12','y(0)=0')

a) $C1*t+C2$	b) $12*t$	c) 12
d) MATLAB would print an error message	e) New prompt	

Q16. >> solve('4*x^2-y')

a) $4*x^2=y$	b) $y^{(1/2)}/2 - y^{(1/2)}/2$	c) Undefined function or variable x
d) MATLAB would print an error message	e) New prompt	

Q17. >> x = linspace(0,pi,10);
>> length(x)

a) 11	b) 1 10	c) 1 11
d) 10	e) New prompt	

Q18. >> Given the following function in MATLAB

```
function fout = HB(n)
x = 1;
for i = 1:n
x = x * i;
end
fout = x;
end
```

Which of the following commands will NOT return an error message and/or warning message?

a) fout(3)	b) HB(3)	c) hb(3)
d) @ HB(3)	e) @fout(3)	

Q19. >> Regarding the following function, which of the following commands is correct:

```
function z = LV(x)
z = sqrt(x);
```

a) fzero('LV',[0, 3])	b) fzero(@LV,[0, 3])	c) fzero(@z,[0, 3])
d) a and b.	e) all of the above	

Q20. Suppose that after execution of the following MATLAB code (*italic*), the Enter ↵ key is pressed. What is the output?

```
>> r = input('Want to continue? Y/N [Y]: ','s');
if (isempty(r))|(res=='Y')|(r=='y')
    r = 'Y'
else
```

```

    r = 'N'
end
want to continue? Y/N [Y]:

```

a) MATLAB will give error message.	b) New prompt.	c) r = N
d) r = Y	e) None of the above	

Q21. Suppose that after execution of the following MATLAB code (*italic*), the Enter ↵ key is pressed. What is the output?

```

>> x = 5;
while x < 25
    disp(x)
    x = 2*x - 1;
end

```

a) New prompt.	b) 17	c) 5 17
d) 5 9 17	e) Error message.	

Q22. Suppose that after execution of the following MATLAB code (*italic*), the Enter ↵ key is pressed. What is the output?

```

>> A = [ [1 2 3]' [3 2 1]' [2 1 3]']; B=A;
for j=2:3,
    for i=j:3,
        B(i,:) = B(i,:) - B(j-1,:)*B(i,j-1)/B(j-1,j-1);
    end
end

```

a) 1 3 2 0 -4 -3 0 0 3	b) 1 3 2 2 2 1 3 1 3	c) a and b.
d) New prompt.	e) Error message.	

Q23. >> F = @(x,y)y+x;
>> Q = dblquad(F,0,2,0,4)

a) 0	b) 16	c) 12
d) 24	e) Error message.	

Q24. >> aa = linspace(0,pi,10); x1 = cos(aa(10))

a) 0	b) 1/2	c) -1
d) New prompt.	e) pi	

Q25. >> The value of JJ after the MATLAB code below executed?

```
JJ=0;
for II=1:2:5
    JJ=JJ+1;
end
```

a) 5	b) 7	c) 3
d) 12	e) 11	

Q26. >> The number of values (terms) will be in the variable coef after execution

```
>> x = [1 3 5 7 9 11]
>> y = [15 17 16 15 16 17]
>> coef = polyfit(x,y,2)
```

a) 2	b) 1	c) 3
d) 4	e) 0	

Q27. >> The value stored in variable q after the Matlab code below executed?

```
for q = 1:1:100
    c = q^0.5;
end
q = c + 5
```

a) 100	b) 10	c) 15
d) 105	e) None of the above	

Q28. >> Given the matrices A and B, which of the following operations will NOT return error message in MATLAB.?

A = [1 3 ; 2 5]

B = [1 ; 8]

a) A.*B	b) B.*A	c) A*B
d) A.B	e) A/B	

Q29. >> The value of z after execution of the following MATLAB script is:

```
>> x = 1;
    y = 2;
    while y < 5;
        z(x) = 2.*y;
        x = x + 1;
        y = y + 2;
    end
```

a) 4	b) 4 4	c) 8
d) 4 8	e) None of the above	

Q30. >> The value the variable q contains after the Matlab code below executes?

```
A = [ 1 3 5 ];
B = [ 2 4 6 ];
q = diff(A) ./ diff(B)
```

a) 1 1	b) 1	c) 2 2
d) 2 1	e) None of the above	

Q31. >> The value the variable q contains after the Matlab code below executes?

```
% main file
A = [ 1 3 5 ];
[q r] = myfunc(A)
% end
%Function File
function [r1,r2] = myfunc(p1)
% function file
n = length(p1);
r1 = sum(p1)./n;
r2 = sqrt(sum((p1 - r1).^2)./n);

return;
```

a) 3	b) 1	c) 5
d) 9	e) None of the above	

Prob. 2 [7 points]: Write a MATLAB code to solve and plot the solution of the following system of differential equations. Type clearly and use ONLY specified space.

$$\frac{dy_1}{dt} = y_2 * y_3, \quad y_1(0) = 0,$$

$$\frac{dy_2}{dt} = -y_1 * y_3, \quad y_2(0) = 1,$$

$$\frac{dy_3}{dt} = -2 * y_1 * y_2, \quad y_3(0) = 1$$

Time interval [0 12]

Prob. 3 [6 points]: The PI (π) value is approximated through the following relationship:

$$\pi = 4 \sum_{k=0}^m \frac{(-1)^k}{2k+1}$$

Using for/while loops/if statements, write a MATLAB code to approximate the value of π . Your code should terminate (stop) once the relative error is less than 5×10^{-6} . The relative error is described as

$$\left| \frac{\text{Exact } \pi - \text{approximated } \pi}{\text{exact } \pi} \right|, \quad \text{exact } \pi = 3.141592653589793.$$

Type clearly and use specified place ONLY. Do NOT use the MATLAB built-in sum function in your code.

Prob. 4 [6 points]: The equation of motion of a mass-spring-damper system is given by:

$$F(t) = m\ddot{x} + B\dot{x} + kx$$

Here, m is effective mass, B is damping coefficient, and k is stiffness of the described system. The system is excited with a force $f(t)$. Write a MATLAB function that accepts/inputs the effective mass m , damping coefficient B , and stiffness k . The MATLAB function returns the resonant frequency in Hertz, $\omega_n = \sqrt{\frac{k}{m}}$, and quality factor $Q = \frac{\sqrt{km}}{B}$.

After writing your function, call your function using $m=1$, $B=2$, and $k=4$. USE SPECIFIED SPACE BELOW.
