Benha University
Faculty of Engineering at Shoubra
Mechanical Engineering Department
Third Year (Power)

Final Term Exam (ELC327)
1st term, 9/01/ 2017
Computer Eng. & programming
Duration : 3:00 hours

Model answer

Question 1 (15 marks)

(1-A) Define the use of the following Matlab function, each point takes [0.5 marks]

Command	description	Command	description
exp( )	e^x -Exponential	factorial ( )	n! - Calculating factorial
int( )	Integer part of complex number	Sqrt( )	Square root $\sqrt{x}$
round( )	Rounds to the closest integer	Abs( )	Absolute value of x, i.e. |x|
log10( )	log x- Common logarithm base (10)	date ( )	Returns the date in dd-mmm-yyyy format. (e.g. **ans = 17-Jan-2015)**
log( )	Ln x -Natural logarithm base (e)	rem( )	Remainder after division

(1-B) Answer the following questions [5 marks]

I- ; prevents the value entered from being immediately echoed on the screen.	**[1 mark]**	II- Clear: clears all variables C; Variable name CLC: clears the command window	**[1 mark]**
III- Bank	**[1 mark]**	IV- 1	**[1 mark]**
V- 12 elements 2 3 4 5 6 7 -9 -8 -7 -6 -5 -4	**[1 mark]**	VI- 2 row, 6 column	**[1 mark]**
VII- 0 0 0 0 0 0	**[1 mark]**	VIII- fix more than one curve on the same graph for separates plot commands	**[1 mark]**
IX- [4 , 8, 12, 16, 20 24]	**[1 mark]**	X- Generating a vector containing **n**, equally spaced numbers in the interval [**a; b**]	**[1 mark]**

(1-C) Write the correct MATLAB command or format to fill in the blank: [5 marks]

I) **disp** **[1 mark]**
II) x=inv(**A**)***b** **[1 mark]**
III) >> fprintf('%1.**4**f **[1 mark]**
IV) **Axis** **[1 mark]**
V) **ones** (i , j) **[1 mark]**

Question 2 (10 marks)

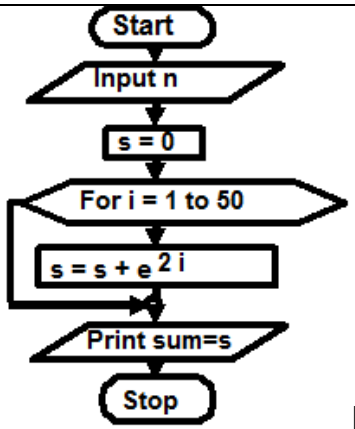
(2-A) $A = \begin{pmatrix} 12 & 8 & 4 & 0 & -4 \\ 14 & 10 & 6 & 2 & -2 \\ 16 & 12 & 8 & 4 & 0 \end{pmatrix}$ **[3 marks]**

(2-B) [4 marks]

[2.0 marks]

```
% program to add a given series from 1 to 50 number

N=50
% or % N=input('Please enter the required upper number ');
S=0;
for i=1:50
        S=S+ exp (2*i);
end
fprintf (' Summation of given series from 1 to %g = %g  \n ' , N,S)
```



[2.0]

(2-C) **[3 marks] = [0.5 marks] for each point**

I- B=[4 2 3; 1 -1 2;3 4 6];	II- x = 4 2 3	III- y = 3 4 6
IV- a = 12 8 18	V- b = 1.3333 0.5000 0.5000	VI- c = 16 4 9
VII- Error - Matrix must be square	VIII- Error-Inner matrix dimensions must agree	IX- $\mathbf{f} = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$
X- g = 2 -1	XI- h = -1	XII- $\mathbf{k} = \begin{pmatrix} 16 & 2 & 9 \\ 2 & 1 & 8 \\ 9 & 8 & 36 \end{pmatrix}$

Question 3 (15 marks)

(3-A) **[5 marks]**

t=0:0.2:20 ;	**[0.5 mark]**
f=6.*t.^2+3.*t-8 ; g=4.*t.*cos(t) ;	**[0.5 mark]** **[0.5 mark]**
subplot(1,2,1) ; plot (t , f , 'b-.' , t , g ,'r*') ; xlabel(' t '); ylabel(' f(t) and g(t)'); title('Function f and g vs. t') legend('f(t)' , 'g(t)')	**[0.5 mark]** **[0.5 mark]** **[1.0 mark]**
subplot(1,2,2) ; plot (f,g,'b'); xlabel(' f '); ylabel(' g '); title('Function g vs. f')	**[0.5 mark]** **[0.5 mark]** **[1.0 mark]**

(3-B) **[5 marks]**

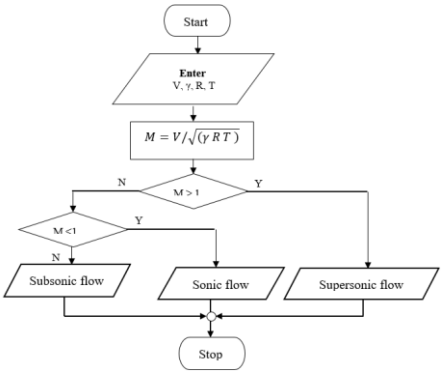
t=linspace(0,5*pi);	**[0.5 mark]**
y1 = exp(sin(t)); y2 = exp(cos(t));	**[0.5 mark]** **[0.5 mark]**
plotyy(t,y1,t,y2,'loglog', 'semilogy')	**[1.0 mark]**
xlabel(' time [sec] ') ylabel(' (\theta) ')	**[0.5 mark]** **[0.5 mark]**
title (' plotting two curves with different scales ') legend ('\theta log-log of exp(sin(t))', '\alpha semi-log of exp(cos(t))') grid on	**[0.5 mark]** **[0.5 mark]** **[0.5 mark]**

(3-C) **[5 marks]**

[2.5 marks]

```
v=input('Please enter the velocity of gas [m/s]= ');
gamma =input('Please enter the heat  γ= ');
R=input('Please enter the characteristic gas constant [kJ/kg K]= ');
T=input('Please enter the temperature of gas in Kelvin [K]= ');
M= v/sqrt(gamma*R*T);
fprintf (' Mach number  M= %g \n', M)
if (M  > 1)
   fprintf (' Supersonic flow (M>1) \n M= %g \n', M)
elseif (M  < 1)
   fprintf (' Subsonic flow (M<1) \n M= %g \n', M)
else
   fprintf (' Sonic flow (M=1) \n M= %g \n', M)
end
```

[2.5 marks]



Question 4 (20 marks)

(4-A) [4 marks]

fplot (inline(' 1./((x-3).^2 + 0.25) '),[0 10 -10 20])	2 marks
>> y = inline(' 1./((x-3).^2 + 0.25) '); >> x = linspace(0,10,100); >> plot(x, y(x)) ; axis([0 10 -10 20];	2 marks

(4-B) [2 marks]

a = [1 4 -7 -10];	[2 mark]
s = linspace(-1,3,201); A = polyval(a , s);	
plot(s , A) title(' Polynomial Function A(s) = s^3+ 4s^2 -7s -10 ')	
xlabel(' s ') ylabel(' A(s) ')	

(4-C) [3 marks]

a = [1 4 -7 -10]; b = [4 - 2 5 -16];	[1.0 mark]
c = a + b % addition	[1.0 mark]
f = conv(a , b) % multiplication	[1.0 mark]

(4-D) [6 marks]

[3.0 mark]

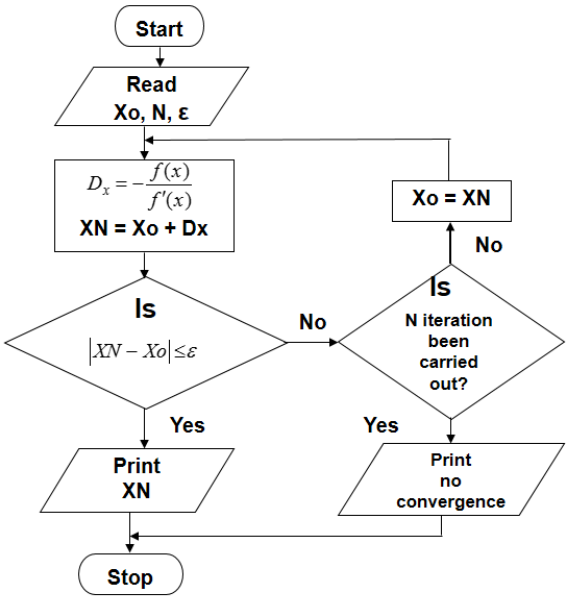
```
function y = f(x)
y = x^3 + x^2 +x- 3;
```

```
function y = df(x)
y = 3*x^2 + 2*x+1;
```

```
It = 0;                                  % iteration counter
x = input(' Initial guess: ' );          % estimate of root
re = input(' Relative error: ' );        % re = 1e-8;
myrel = 1;                               % greater value of relative error
fprintf (' It \t x \t f(x) \n '); fprintf (' ---------------------\n '); %
header
while myrel > re & (It < 20)
    xold = x;
    x = x - f(x)/df(x);
   It = It + 1;
   fprintf (' %d \t %0.3f \t %5.3f \n ', It, x, f(x)) %disp( [x f(x)]
   myrel = abs((x-xold)/x);
end;
 if myrel <= re
   disp(' Zero found at ' ), disp( x )
else
   disp(' Zero NOT found ' )
end;
```

[2.0 mark]

Define f(x) and their derivative df/dx=f'




```
>> p=[1   1   1   -9];
>> roots(p)
```

[1.0 mark]

(4-E) [5 marks]

```
function y = trap( fn, a, b, h )
n = (b-a)/h;
x = a + [1:n-1]*h;
Sy = sum(feval(fn, x));
y = h/2*(feval(fn, a) + 2*Sy + feval(fn, b));
```

[2.0 mark]

```
>> f1 = inline(' 1./((x-3).^2 + 0.25) ');
>> trap(f1,1,10,0.2)
     ans =
```

[2.0 mark]

```
>> x=1:0.2:10;
>> y = 1./(x-3).+8*x.^2) ;
>> trapz(x,y)
```

[1.0 mark]

With our best wishes; Dr. Mohamed Saber Sokar & Dr. Hend Yassien