SOLUTIONS MANUAL FOR

Signals and Systems Laboratory with MATLAB

by

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CRC Press
Taylor & Francis Group

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Chapter 1: Introduction to MATLAB

1)

```
a=1:10;
sq=a.^2;
sqr=sqrt(a);
```

2)

```
a=1:10;
sum(a.^2)
```

3)

```
a=0:2:18;
b=2:2:20;
c=a./b
```

4)

```
x=1:100;
y=x(2:2:100)
```

5)

```
x=1:100;
y=x(3:3:100)
```

6)

```
add=[ 13 12 11 10 10];
sub=[-11 -6 -1 4 8];
a=(add+sub)/2;
b=(add-sub)/2;
```

7)

```
[a1,a2]=size(A);
[b1,b2]=size(B);
C=zeros(a1,b2);
 if a2~=b1
     error('this multiplication cannot be done');
 end
for i=1:a1
    for j=1:b2
        for k=1:a2
    C(i,j)=C(i,j)+A(i,k)*B(k,j);
        end
    end
end
```

8)

```
 t=0:.1:5;
 f=t.*exp(-t);
 plot(t,f)
```

9)

```
T=1;
b=0.5;
t=-5*T:.001:5*T;
h=sinc(t/T).*cos(pi*b*t/T)./(1-4*b^2*t.^2/T^2)
plot(t,h)
```

10)

```
subplot(231);
T=1; b=0;
t=-5*T:.001:5*T;
h=sinc(t/T).*cos(pi*b*t/T)./(1-4*b^2*t.^2/T^2);
plot(t,h);
title('T=1 , b=0')

subplot(232);
T=1; b=0.5;
t=-5*T:.001:5*T;
h=sinc(t/T).*cos(pi*b*t/T)./(1-4*b^2*t.^2/T^2);
plot(t,h);
title('T=1 , b=0.5')

subplot(233);
T=1; b=1;
t=-5*T:.001:5*T;
h=sinc(t/T).*cos(pi*b*t/T)./(1-4*b^2*t.^2/T^2);
plot(t,h);
title('T=1 , b=1')

subplot(234);
T=3; b=0;
t=-5*T:.001:5*T;
h=sinc(t/T).*cos(pi*b*t/T)./(1-4*b^2*t.^2/T^2);
plot(t,h);
title('T=3 , b=0')

subplot(235);
T=3; b=0.5;
t=-5*T:.001:5*T;
h=sinc(t/T).*cos(pi*b*t/T)./(1-4*b^2*t.^2/T^2);
plot(t,h);
title('T=3 , b=0.5')

subplot(236);
T=3; b=1;
t=-5*T:.001:5*T;
h=sinc(t/T).*cos(pi*b*t/T)./(1-4*b^2*t.^2/T^2);
plot(t,h);
title('T=3 , b=1')
```

11)

```
 A=[ 1 2 3; 4 5 6; 7 8 9];
 B=A';
 c=B(:)
```

12)

```
function [pro, div]= comp(z1,z2)
pro=z1*z2;
div= z1/z2;
```

13)

```
function y= maxi(a,b,varargin)

 if nargin ~=2
     error('Please insert two input arguments')
 end

if abs(a)>=abs(b)
    y=a;
else
    y=b;
end
```

14)

```
function [sorted,zer,posit]= oper(a)

sorted=sort(a,'descend');
zer=sum(a==0);
j=1;
for i=1:length(a)
 if a(i)>0
     posit(j)=a(i);
     j=j+1;
 end
end
```

15)

```
x=1:102;
i=3;
k=1;
while(i<102)
    j=2;
    while j<=i
    if rem(x(i),x(j))==0
        break
```

```
    else

        if j==(i-1)
            x(i);
            a(k)=x(i);
            k=k+1;

        end
        j=j+1;


    end
    end

i=i+1;
end
a
```

16)

```
fid=fopen('Fahrenheit.txt')
fahren=fscanf(fid,'%f')
fclose(fid);
cels=(fahren-32)*5/9;

fid=fopen('Celsius.txt','w')
fprintf(fid,'%f \n',cels);
fclose(fid)
```

17)

```
[x,y]=solve('y=1-x^2','y=1+x')
```

18)

```
[x,y]=dsolve('Dx=-y', 'Dy=-x', 'x(0)=4', 'y(0)=3')
```

Chapter 2: Signals

1)

```
t=-5:.1:10;
r5=(t+5).*heaviside(t+5);
r3=(t+3).*heaviside(t+3);
r2=(t+2).*heaviside(t+2);
r=t.*heaviside(t);
u=heaviside(t);
u2=heaviside(t-2);
u5=heaviside(t-5);
u8=heaviside(t-8);
x=r5-r3-r2+r+u+u2+u5-3*u8;
plot(t,x)
ylim([-.1 3.1])
```

2) $\Omega = 2 \Rightarrow \mathrm{T} = 2\pi / \Omega = \pi$

```
T=pi;
t=0:.1:3*T;
x=3*exp(-j*2*t);
plot(t,real(x),t,imag(x));
legend('Re[x(t]','Im[x(t)]')
```

3) $\Omega_1 = 2\pi \Rightarrow \mathrm{T}_1 = 1$ and $\Omega_2 = 3\pi \Rightarrow \mathrm{T}_2 = 2/3$. For k=2 and m=3 , $\mathrm{T} = k\mathrm{T}_1 = m\mathrm{T}_2 = 2$.

```
T=2;
t=0:.1:4*T;
x=cos(2*pi*t)+sin(3*pi*t);
plot(t,x)
grid
```

4)

```
t=0:.1:20;
x=t.*exp(-0.1*t).*cos(t);
x_t=-t.*exp(0.1*t).*cos(-t);
xe=(x+x_t)/2;
xo=(x-x_t)/2;
y=xe+xo;
subplot(221);
plot(t,x)
subplot(222)
plot(t,xe);
subplot(223)
plot(t,xo);
subplot(224)
plot(t,y)
```

5)

```
 syms n
 x=0.9^n;
 E=symsum(x,n,0,inf)
```

6)

```
 t1=0:.1:2;
 x1=t1;
 t2=2:.1:4;
 x2=4-t2;
 t=[t1 t2];
 x=[x1 x2];
 plot(t,x)
 plot(-t,x)
 plot(2*t,x)
 plot(-(1/4)*(2+t),x)
```

7)

```
function u=unitstep(t0);
t1=t0-10:.1:t0;
t2=t0:.1:t0+10;
u1=zeros(size(t1));
u2=ones(size(t2));
t=[t1 t2];
u=[u1 u2];
plot(t,u);
ylim([-.1 1.1]);
```

8)

```
function d=unitdirac(t0);
t1=t0-10:.1:t0-.1;
t2=t0;
t3=t0+.1:.1:t0+10;
d1=zeros(size(t1));
d2=1; % or u2 =inf
d3=zeros(size(t3));
t=[t1 t2 t3];
d=[d1 d2 d3];
plot(t,d);
ylim([-.1 1.1]);
```

9)

```
function r=unitramp(t0);
t1=t0-10:.1:t0;
t2=t0:.1:t0+10;
r1=zeros(size(t1));
r2=t2-t0;
t=[t1 t2];
r=[r1 r2];
plot(t,r);
```