Autumn Holzinger Continuous Time and Discrete Time Signals

Appendix:

2.a

2.b

A=0.5 B=2 a=-1 n0=1 based off of the equations given, so imputting them into the final equation of 2.a

x3[n]=

3.1

x[n]=2µ[n]

x[-n]=2µ[-n] x[n] so its not even -x[-n]=-2µ[-n] x[n] so its not odd neither

2µ[n]+ 2µ[-n])= u[n]+u[-n]

x[n]= u[n]+u[-n]+

x[n]= 2µ[n]

3.2

x[n]=cos(0.1n)

x[-n]=cos(-0.1n)=x[n] therefore it is even

4.1

x(t)=-4t

-x(-t)=-(-4(-t))=-4t so its odd

4.2

x(t)=-µ(t-1)+µ(-t-1)

-x(-t)=µ(-t-1)+(-µ(t-1))=x(t) so it is odd

5.a

5sin(15t-(π/3)) To1=

2sin(7t) To2=

x(t)= 5sin(15t-(π/3))+ 2sin(7t)

Ratio of Integers: (To1/ To2)=7/15 Signal is periodic

Fundamental period of x(t)= 2π/1=2π

6.1

x[t]=cos(πt)

T=0.125 seconds

x[n]=cos(0.125πn)

x[n+n0]=cos(0.125π(n+n0))=cos(0.125πn+0.125πn0)

0.125πn0=πk

if k=1 then n0=8 So number of periods is 1 and number of samples is 8

6.2

x[t]=cos(πt)

T=0.13 seconds

x[n]=cos(0.13πn)

x[n+n0]=cos(0.13π(n+n0))=cos(0.13πn+0.13πn0)

0.13πn0=πk

if k=13 then n0=100 So number of periods is 13 and number of samples is 100

7.0

Matlab Code:

#1

t=[-2 -1 -1 0 0 1 2 2 3]

x=[ 0 0 -1 -1 0 0.5 1 0 0]

subplot(211),plot(t,x)

plot(t,x,'linewidth',1.5)

xlabel('t')

ylabel('x(t)')

title('Original');

axis([-3 3 -1 1]);

grid;

subplot(212)

z=((3\*t)-6);

plot(z,x,'linewidth',1.5)

xlabel('z')

ylabel('x(z)')

title('1.a');

axis([-3 3 -1 1])

grid;

subplot(213)

b=((-4\*x)+2);

plot(t,b,'linewidth',1.5)

xlabel('t')

ylabel('Q(b)')

title('1.b');

axis([-3 3 -1 1])

grid;

#2

n=[-2 -1 0 1 2 3 4]

x3=[-4 -8 -8 -4 0 -4 -4]

stem(n,x3,'linewidth',1.5)

xlabel('n')

ylabel('x3')

title('Problem 2 part b')

axis([-3 5 -9 1]);

grid;

#3.1

t = -1:0.05:1;

y = 2\*ones( size(t) ) .\* (t >= 0) ;

subplot(311),stem(t,y,'linewidth',1.5);

xlabel('t');

ylabel('x(t)');

title('3.1 original plot');

axis([-2 2 -2 3]);

grid

yeven=(ones( size(t) ) .\* (t >= 0))+(ones( size(t) ) .\* (t <= 0));

subplot(312),stem(t,yeven,'linewidth',1.5)

xlabel('t');

ylabel('x(t)');

title('Even signal');

axis([-2 2 -1 3]);

grid

yodd=(ones( size(t) ) .\* (t >= 0))-(ones( size(t) ) .\* (t <= 0));

subplot(313),stem(t,yodd,'linewidth',1.5)

xlabel('t');

ylabel('x(t)');

title('Odd signal');

axis([-2 2 -1 3]);

grid;

#3.2

t = -80:0.01:80;

y=cos(.1\*t);

subplot(211),plot(t,y)

stem(t,y,'linewidth',1.5)

xlabel('t')

ylabel('x(t)')

title('Original plot')

axis([-80 80 -5 5])

grid

t = -80:0.01:80;

yeven=cos(.1\*t);

subplot(212),plot(t,yeven)

stem(t,yeven,'linewidth',1.5)

xlabel('t')

ylabel('x(t)')

title('Even graph')

axis([-80 80 -5 5])

grid;

#4.1

t=-5:1:5;

y=-4\*t;

subplot(211)

plot(t,y,'linewidth',1.5)

xlabel('t')

ylabel('x(t)')

title('4.1 Original plot')

axis([-3 3 -4 4])

grid;

y=-4\*t;

subplot(212)

plot(t,y,'linewidth',1.5)

xlabel('t')

ylabel('x(t)')

title('Odd signal')

axis([-3 3 -4 4])

grid;

#4.2

t=[-5:.01:5]

u=ones( size(t) ) .\* (t >= 0);

u1=-(ones( size(t) ) .\* (t >= 1));

u2=(ones( size(t) ) .\* (t <= -1));

subplot(211)

plot(t,u1+u2,'linewidth',2)

xlabel('t')

ylabel('x(t)')

title('4.2 Original plot')

axis([-4 4 -4 4])

grid;

subplot(212)

plot(t,u1+u2,'linewidth',2)

xlabel('t')

ylabel('x(t)')

title('Odd signal')

axis([-4 4 -4 4])

grid;

#5

t=-80:0.5:80;

y=5\*sin(15\*t-pi/3)+2\*sin(7\*t);

plot(t,y)

xlabel('t')

ylabel('x(t)')

title('Number 5 plot')

axis([-10 10 -8 9])

grid;

#6

t= -100:0.125:100;

y= cos(pi\*t);

subplot(411),plot(t,y)

xlabel('t')

ylabel('x(t)')

title('Problem 6, sampele=0.125 continious time')

axis([-5 5 -3 3])

grid;

subplot(412),stem(t,y,'linewidth',1.5)

xlabel('t')

ylabel('x[t]')

title('problem 6, sample=0.125 discrete time')

axis([-5 5 -3 3])

grid;

t=-80:0.13:80;

y=cos(pi\*t)

subplot(413),plot(t,y)

xlabel('t')

ylabel('x(t)')

title('problem 6, sample=0.13 continious time')

axis([-8 8 -2 2])

grid;

subplot(414),stem(t,y,'linewidth',1.5)

xlabel('t')

ylabel('x(t)')

title('problem 6, sample=0.13 discrete time')

axis([-5 5 -3 3])

grid;













