Barak Barclay

Dr. Al Batten

ECE2610-001

Lab 2

**Section 5:**

(a)

Code:

>> fk=[0.5,0.5,0.5];

>> xk=[2,2\*exp(-1.25\*pi\*j),(1-j)];

>> dur = 2\*pi/(pi)\*3;

>> fs=10000;

>> tstart=-0.5;

>> [xx,tt]=syn\_sin(fk,xk,fs,dur,tstart);

period =

2 2 2

(b)

Code:

>> zprint([2\*exp(j\*0),2\*exp(-1.25\*pi\*j),(1-j)\*exp(j\*0)])

Z = X + jY Magnitude Phase Ph/pi Ph(deg)

2 0 2 0.000 0.000 0.00

-1.414 1.414 2 2.356 0.750 135.00

1 -1 1.414 -0.785 -0.250 -45.00

(c)

Code:

>> x=2+2\*exp(-j\*pi\*1.25)+1-exp(j\*pi/2)

x =

1.5858 + 0.4142i

>> mag = abs(x)

mag =

1.6390

>> phi = angle(x)

phi =

0.2555 rad which is slightly more than the calculated value 2.378 rad.

**Section 6:**

(a)

Mathematical expression:

d1= sqrt(xv^2+dt^2)

t1=d1/c = (sqrt(xv^2+dt^2))/(3\*10^8) s

(b)

Mathematical expression:

d2=sqrt [(dt-dyr)^2+dxr^2] + sqrt [(dxr-xv)^2+dyr^2].

t2= d2/c = (sqrt [(dt-dyr)^2+dxr^2] + sqrt[(dxr-xv)^2+dyr^2])/3\*10^8 s

(c)

Code:

f=150000000;

dur=0.00000002;

t=0:1/(1000000\*f):dur;

d1=1500;

d2=sqrt((1500-900)^2+100^2)-sqrt((100-0)^2+900^2);

c=3\*10^8;

t1=d1/c;

t2=d2/c;

r=cos(2\*pi\*f\*(t-t1))-cos(2\*pi\*f\*(t-t2));

plot(t,r), grid on

(d)

Code:

>> X=exp(j\*phi1)-exp(j\*phi2)

X =

1.6794 + 0.7338i

>> A = abs(X)

A =

1.8327

>> r=X\*exp(j\*2\*pi\*f\*t);

>> plot(t,r), grid on

Other information:

When doing a complex addition a new phasor is created which can be put in the A\*exp(j\*phi) form. The exp(j\*phi) part of it only gives the direction part of the vector. So, the amplitude will be the magnitude of a complex amplitude (phasor).

(e)

Mathematical expression:

X=exp(j\*(-2\*pi\*((sqrt(xv^2+dt^2)/c)/T))

X=exp(j\*(-2\*pi\*(( (sqrt((dt-dyr)^2+dxr^2)+sqrt((dxr-xv)^2+dyr^2))/c))/T))

Code:

function ss=L2S6Pe(xv)

dur=0.00000002;

c=3\*10^8;

t1= sqrt(xv.^2+1500.^2);

t2=sqrt((1500-900).^2+100.^2)-sqrt((100-xv).^2+900.^2);

phi1=-2\*pi\*(t1/(dur/3));

phi2=-2\*pi\*(t2/(dur/3));

if xv>100

X=exp(j\*phi1)+exp(j\*phi2);

else

X=exp(j\*phi1)-exp(j\*phi2);

end

ss=abs(X);

plot(xv,ss),grid on

end

(f)

Code:

>> L2S6Pe(0:300)

Other Information:

The peak value from the complex amplitude is the absolute value of the complex amplitude.

(g)

The largest signal strength was 2 and the smallest was 0.0119. At times the reflection will constructively interfere and at times the reflections will destructively interfere. There are no positions where there is complete cancellation.

Code:

M=max(ss)

m=min(ss)