Faculty of Engineering and Technology

Department of Electrical and Computer Engineering

ENEE2312

Signals and Systems

Matlab Assignment

Prepared by:

Ayham Maree-ID#:1191408

Section: 1

Instructor: Dr. Ashraf Al-Rimawi

Date: 19\8\2021

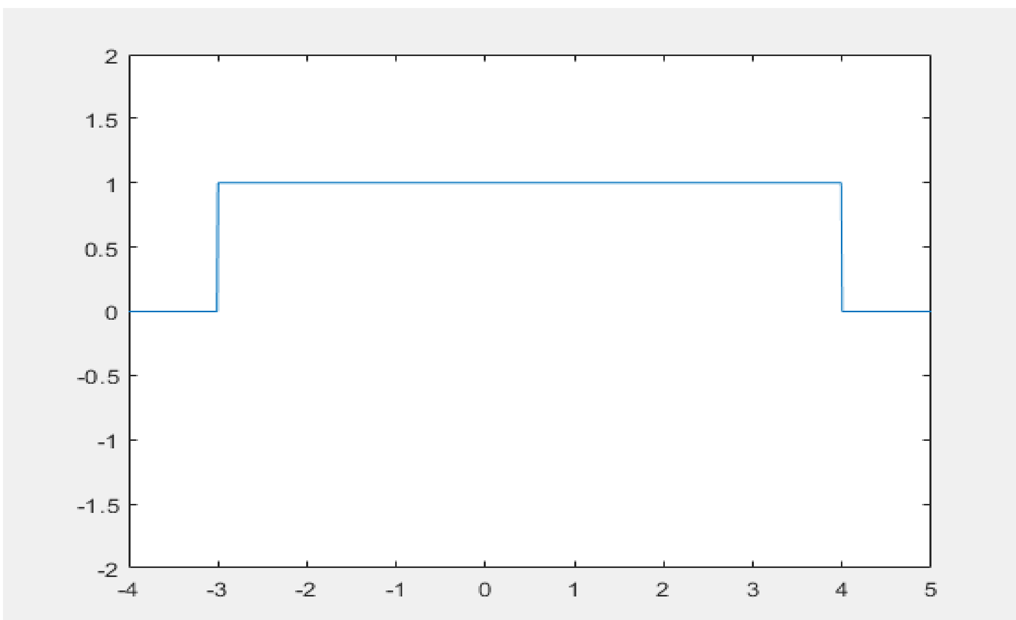
Q(1):

A)

Code:

```
clear all                    % clear all variables from matlab workspace
close all
clc                          % clear all figures
t = -10:0.01:10;
xt1 = heaviside(t+3) -  heaviside(t-4);
plot(t,xt1)
axis ([-4 5 -2 2])
```

Result:



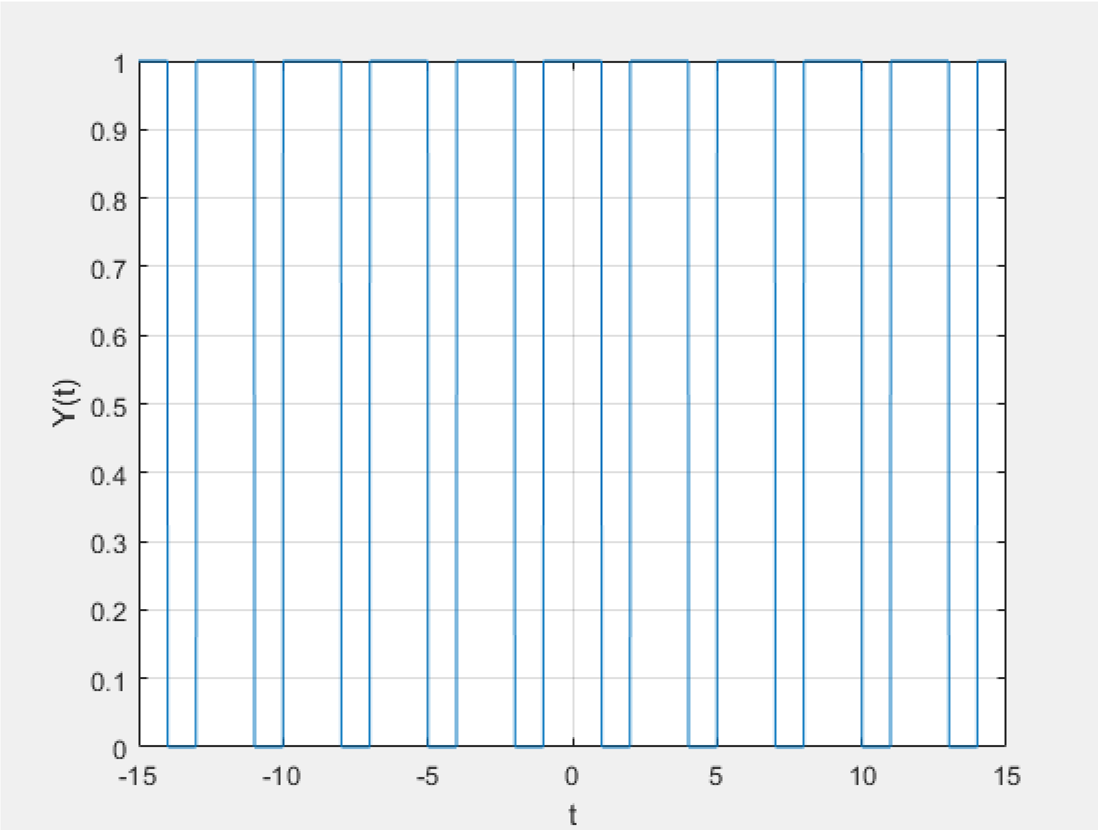
B)

Code:

```
t2 = -15:0.01:15; % time
nval = floor((max(abs(t2))+1)/3)+1; % required limit of n
Y = 0; % initialize the pulse train signal
for n=-nval:nval % values of n for the range of t
Yn=rectangularPulse((t2-3*n)/2); % rectangular pulse
Y=Y+Yn; % performs summation
end
```

```
% plot Y(t) pulse train
figure(2)
axis([-20 20 -2 2])
plot(t2,Y)
xlabel('t')
ylabel('Y(t)')
grid on
```

Result:

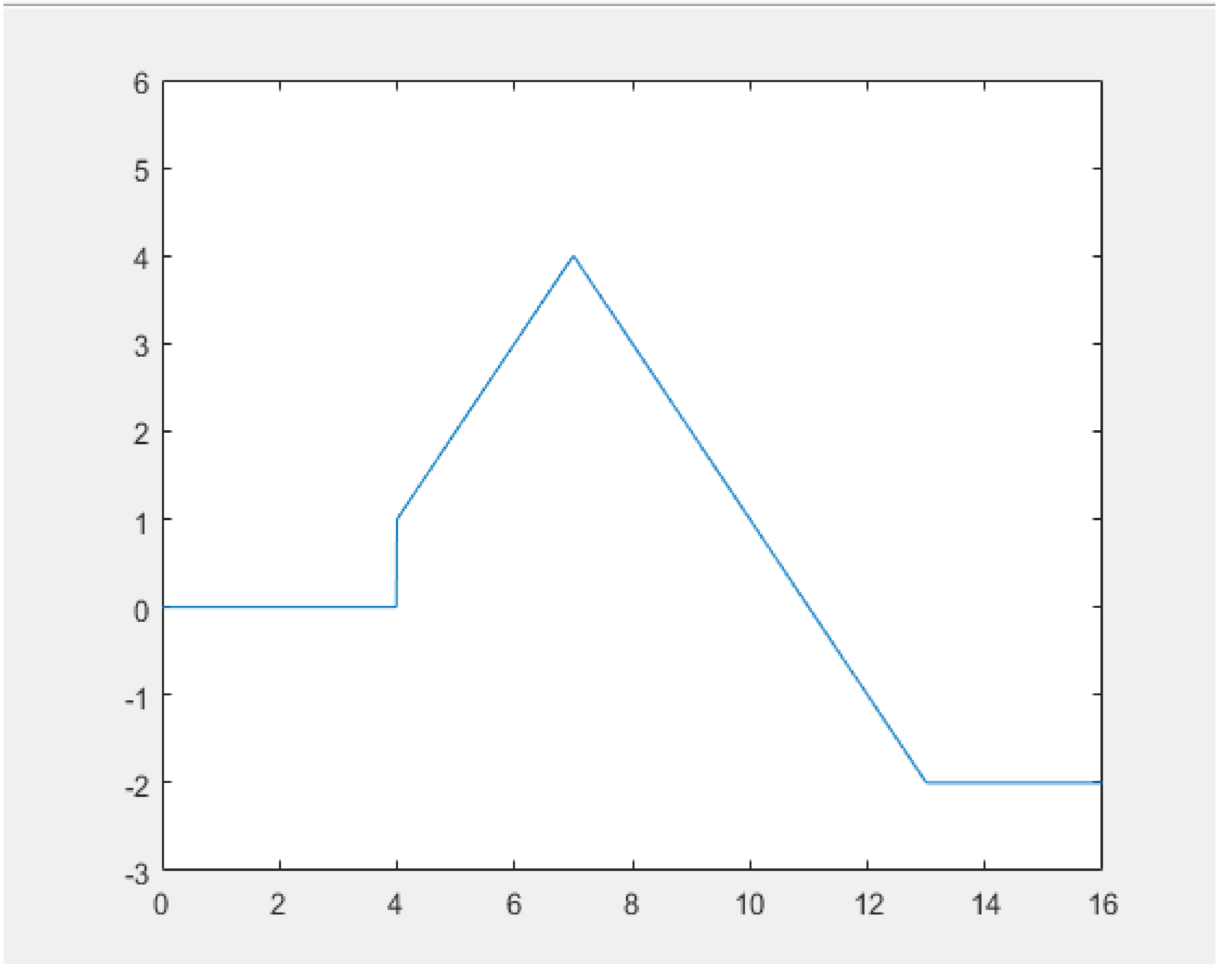


C)

Code:

```
%C
t=-10:0.01:16;
xt3 = heaviside(t-4) + (t-4).*heaviside(t-4) - 2*(t-7).*heaviside(t-7) + (t - 13).*heaviside(t - 13);
plot(t,xt3)
axis ([0 16 -3 6])
```

Result:



Q (2):

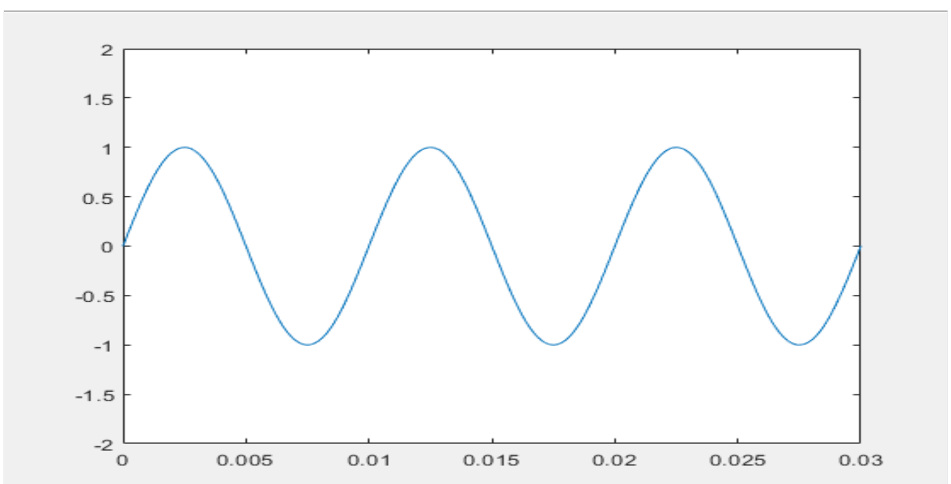
A) Code:

```
clear all
close all
clc
 t=0:0.0001:3;
yt1= sin(200*pi*t);
 figure(1)
plot(t,yt1)
```

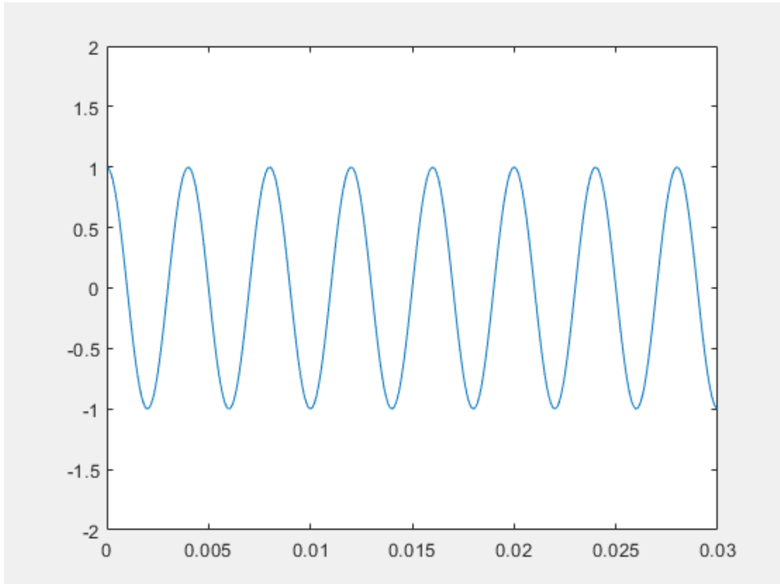
```
axis([0 0.03 -2 2])
yt2= cos(500*pi*t);
figure(2)
plot(t,yt2)
axis([0 0.03 -2 2])
Yt= yt1.*yt2;
figure(3)
plot(t,Yt)
axis([0 0.03 -2 2])
```

Result:

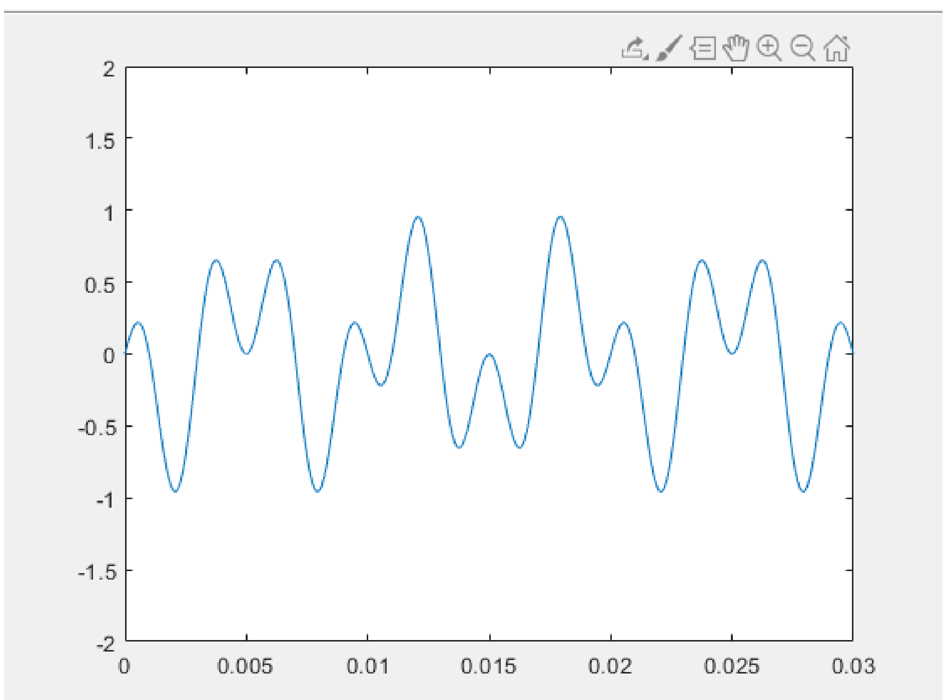
1) Y1=Sin(200*pi*t)



2) Y2=Cos(500*pi*t)



3) Y=Y1*Y2



B)

1)X1(t)=sin(200*pi*t)

Note w=2*pi/T

200*pi=2*pi/T

T=1/100

W=2*pi*f

200*pi=2*pi*f

F=100 HZ

To check if it is periodic or not we will find X1(t +T) → X1(t +T) =sin (200*pi*(t +T))

=sin (200*pi*t + 200*pi*T)

=sin (200*pi*t + 200*pi*1/100)

=sin(200*pi*t + 2*pi)

So, it is periodic signal.

2) Y2=Cos (500*pi*t)

Note w=2*pi/T

500*pi=2*pi/T

T=1/250

W=2*pi*f

200*pi=2*pi*f

F=250 HZ

To check if it is periodic or not we will find X1(t +T) → X1(t +T) =cos (500*pi*(t +T))

=cos (500*pi*t + 500*pi*T)

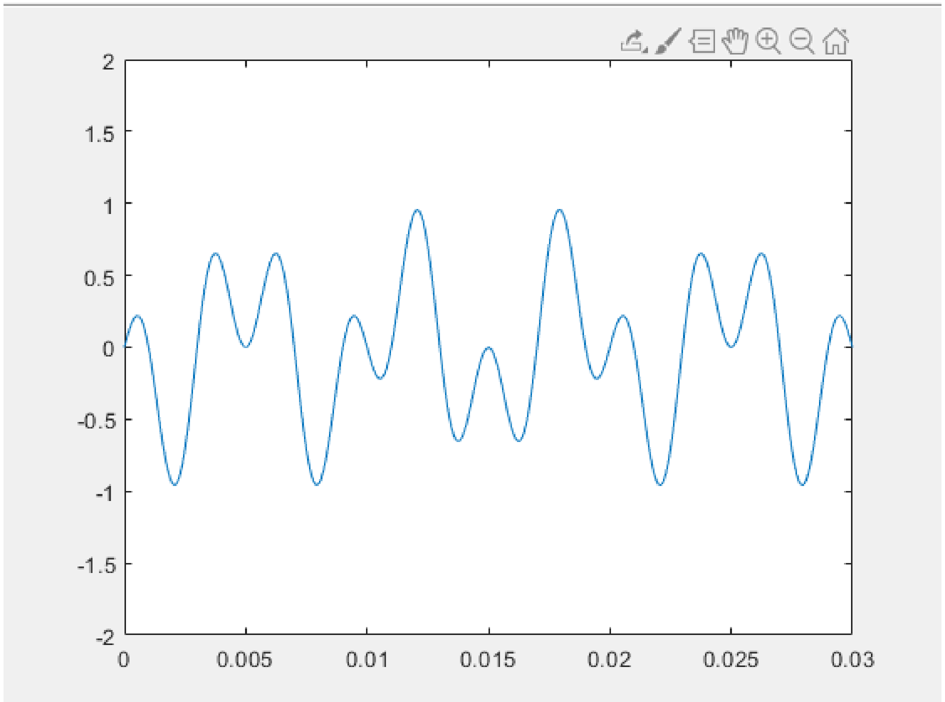
=cos (500*pi*t + 500*pi*1/250)

=cos (500*pi*t + 2*pi)

So, it is periodic signal.

3)Y=sin (200*pi*t)*cos (500*pi*t)

From the plots, the generated signal is periodic signal and we can find the frequency by finding the fundamental period T0 from the graph



T0= 0.03-0.01=0.02 sec

F0= 1/T0=50 Hz

Q (3):

Code:

```
clc;
clear all;
close all;
 syms t y(t) %symbolic variables
equation = diff(y,t) + 30*y(t) == 20; %differential eqn.
condition = y(0) == 0; %initial condition
 y(t) = dsolve(equation,condition) %solution
```

1) **Differential Equation Solution with y(0)=0 and y'(0)=0:**

```
y(t) =

2/3 - (2*exp(-30*t))/3

fx >>
```

2) + 3)

Using subplots:

Code:

```
clc;
clear all;
close all;
syms t y(t) %symbolic variables
equation = diff(y,t) + 30*y(t) == 20; %differential eqn.
condition = y(0) == 0; %initial condition
y(t) = dsolve(equation,condition) %solution
t = 0:0.001:1; %time domain
x = 20*(t>=0); %x(t) = 20u(t)
digits(6); %precision of data
y = double(vpa(y(t))); %y(t)
f = -100:1:100; %frequency domain
dt = t(2)-t(1); %step size (time)
for i = 1:length(f)
X(i) = sum(x.*exp(-2*1i*pi*f(i)*t))*dt; %X(f)
Y(i) = sum(y.*exp(-2*1i*pi*f(i)*t))*dt; %Y(f)
H(i) = Y(i)/X(i); %H(f)
end
subplot 211; plot(f,abs(H),'b'); grid on; %Magnitude plot
ylabel("|H(f)|");
```

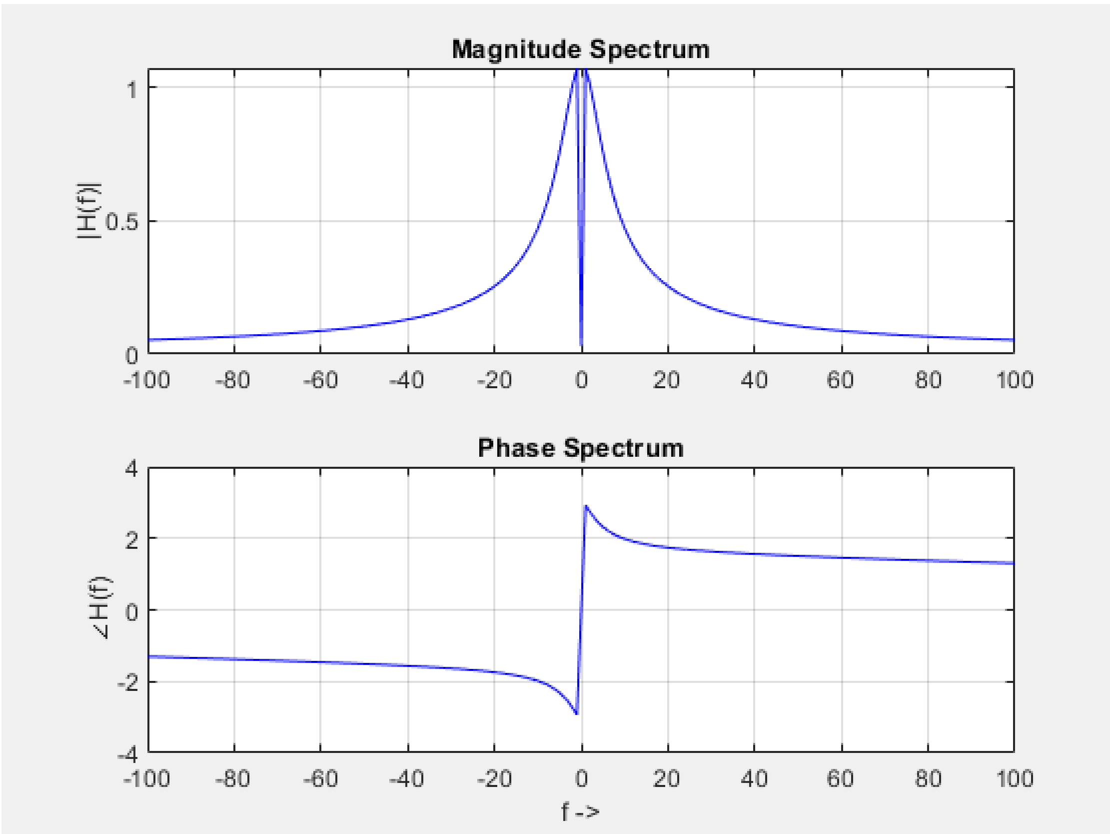
```
title("Magnitude Spectrum");

subplot 212; plot(f,angle(H),'b');grid on; %Phase plot

ylabel("{\angle}H(f)");

title("Phase Spectrum");

 xlabel("f ->");
```



Q4)

Code:

```
syms t taw

xt = (10*exp(-0.2*taw)).*(heaviside(taw - 5)- heaviside(taw - 9));

 ht = (10*exp(0.2*(t- taw))).*(heaviside(t- taw)- heaviside(t- taw - 2));

 conv= int(x4*h,toe,0,30);

fplot(conv,[0 30])

axis ([-1 30 -0.5 80]);
```

Result: