Electrical Engineering Department

Signals and Systems

Matlab Assignment

Student Name: Amal AbuHmood

Student ID:1192141

Instructor: Ashraf Al-remawi

Section: 2

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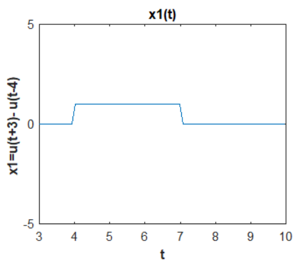
Question 1:

Generate and plot the following signals using MATLAB:

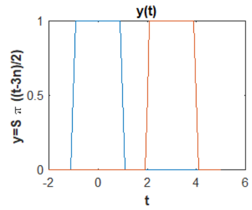
1. X1(t) = u(t+3)- u(t-4)

```
%q1.1
clear all
close all
clc
syms x t
y1= heaviside(t-4); %u(t-4)
y2= heaviside(t-7);   %u(t-7)
x = y1-y2;
subplot(2,2,1), ezplot(x,[3 10 -5 5]);
```



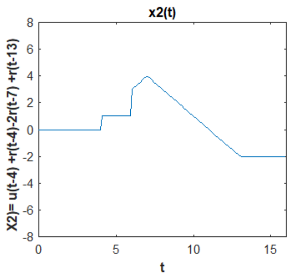
2. A finite pulse from (-∞ to ∞) Σ Π ((t-3n)/2)

```
%q1.2
t=-2:0.1:5;
x1 =1.* rectangularPulse(-1,1,t);  %pi(t\2)
x2 =1.* rectangularPulse(2,4,t);  %pi((t-3)\2)
subplot(2,2,2); %to make (2*2)figure
plot(t,x1)
hold on
plot(t,x2)
```



3. X2(t)= u(t-4) +r(t-4)-2r(t-7) +r(t-13) in the time interval [0 16]

```
%q1.3
y1 = heaviside(t-4);
y2=(t-4).*heaviside(t-6);
y3=2*(t-7).*heaviside(t-7);
y4=(t-13).*heaviside(t-13);
x=y1+y2-y3+y4;
subplot(2,2,3);
ezplot(x,[0 16 -8 8]);
```



Question 2:

1. Generate and plot the signals y1(t)= sin (200πt), y2(t)= cos(500πt), then determine y1 and plot the product of two signals.

```
%q2
syms m t
y1 = sin(200.*pi.*t);
subplot(2,2,1);
ezplot(y1,[0 (3/100)]);
y2 = cos(500.*pi.*t);
subplot(2,2,2);
ezplot(y2,[0 (3/100)]);
m = y1.*y2;
subplot(2,2,3);
ezplot(m,[0 1]);
```

The figures of the three signals:

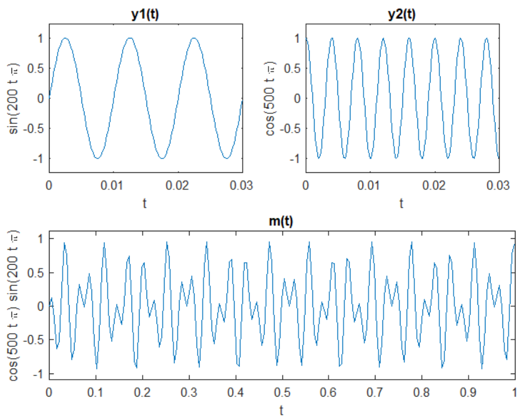


Fig.2.1

2. Determine, using the MATLAB plots, if the generated signal is periodic. In case a signal is periodic, determine its fundamental frequency.

Ans: from the previous results graphs we can see that product of the periodic signals are periodic with fundamental frequency 50 Hz.

Question 3:

Write For the following differential equation

$dy(t)/dt + 30\ y(t) = 20$

1. Write the program that solve the following differential equation (for t>0) using zero initial conditions.

```
%q3.1
syms y(x)
eq1 = diff(y,x)+30*y==20;
Dy = diff(y,x);
cond1 = y(0)==0;
solution1 = dsolve(eq1,cond1);
simpleSolution1 = simplify(solution1);
--------------------------------------
simpleSolution1 =


2/3 - (2*exp(-30*x))/3
```

2. Evaluate the Fourier Transform of the Transfer Function H(f)=Y(f)/X(f).

```
%q3.2
t=0:0.01:20;
h = diff(y,x)+30*y==20;
H = fft(h);
H = fftshift(fft(h));
```

3. Plot the magnitude and phase of the Transfer Function H(f).

```
%q3.3
Subplot(2,2,1), plot(t,h);
```

Question 4:

Write a program that computes and plots the convolution of the functions

$x(t) = (10\ e$^$(-0.2t)\ )\Pi((t-7)/4)$, $h(t) = (10e$^$(0.2\ t)\ )\Pi((t-1)/2)$

```
%q4
t=0:0.01:20;
xt=10.*exp(-0.2.*t).*(((t-5)>=0)-((t-9)>=0)); %gate
junction is from (7-(4/2)) to (7+(4/2))
ht=10.*exp(0.2.*t).*(((t)>=0)-((t-2)>=0));%gate
junction is from (1-(2/2)) to (1+(2/2))
y=conv(xt,ht);%convolution using conv
plot(0:0.01:40,y);%to plot the convolution of xt and
ht
```