PWM

```
clc;
clear;
close all;
fm=input('Message frequency=');
fc=input('Carrier Sawtooth frequency=');
t=0:0.001:1;
m=4.*sin(2*pi*fm*t);
%Message amplitude must be less than Sawtooth
subplot(3,1,1);
plot(t,m);
xlabel('Time');
ylabel('Amplitude');
title('Message Signal');
legend('Message Signal ---->');
grid on;
%##########Carrier Signal#################
A=10;
c=A.*sawtooth(2*pi*fc*t);
%Carrier sawtooth
subplot(3,1,2);
plot(t,c,'red');
xlabel('Time');
ylabel('Amplitude');
title('Carrier sawtooth wave');
legend('Carrier Signal ---->');
grid on;
%############PWM Signal####################
 n=length(c);
 %Length of carrier sawtooth is stored to ‘n’
 for i=1:n %Comparing Message and Sawtooth amplitudes
```

```
if(m(i)>=c(i))
pwm(i)=1;
else
pwm(i)=0;
end
end
subplot(3,1,3);
plot(t,pwm,'green');
xlabel('Time');
ylabel('Amplitude');
title('PWM Signal');
legend('PWM modulated Signal ---->');
axis([0 1 0 1.25]);
grid on;
```

PPM

```
kclc;
clear ;
close all;
fm=2;
fc=40;
%t=0:0.001:1;
fs = 1200;
% sampling frequency
t = 0:1/fs:1;
%##########Message Signal################
m=5.*sin(2*pi*fm*t); %Message amplitude must be less than Sawtooth
subplot(4,1,1);
plot(t,m);
xlabel('Time');
ylabel('Amplitude');
title('Message Signal');
legend('Message Signal ---->');
grid on;
%##########Carrier Signal################
 A=10;
 c=A.*sawtooth(2*pi*fc*t);
 %Carrier sawtooth
 subplot(4,1,2);
 plot(t,c,'red');
 xlabel('Time');
 ylabel('Amplitude');
 title('Carrier sawtooth wave');
 legend('Carrier Signal ---->');
 grid on;
 %###########PWM Signal
```

```
n=length(c); %Length of carrier sawtooth is stored to n’
 for i=1:n %Comparing Message and Sawtooth amplitudes
 if(m(i)>=c(i))
 pwm(i)=1;
 else
 pwm(i)=0;
 end
 end
 subplot(4,1,3);
 plot(t,pwm,'green');
 xlabel('Time');
 ylabel('Amplitude');
 title('PWM Signal');
 legend('PWM modulated Signal ---->');
 axis([0 1 0 1.25]);%X-Axis varies from 0 to 1 & Y-Axis from 0 to 1.25
 grid on;
 %############PPM Signal#####################
duty = 10; % no. of samples in one square wave period
t_period = fs/fc;
% no. of samples in on
on_t = t_period/duty;
s = square(2*pi*fc*t,duty);
s(find(s<0)) = 0;
ppm = zeros(1,length(s));
% find ids where carrier is greater than
id = find(c > m);
 idd = diff(id);
 iddd = find(idd ~= 1);
 temp(1) = id(1);
 temp(2:length(iddd)+1) = id(iddd + 1);% ppm signal
 for i = 1:length(temp)
```

```
ppm(temp(i) : temp(i) + on_t -1) = 1;
end
subplot(4,1,4);
plot(t,ppm,'c','lineWidth',1);
title('PPM Signal');
xlabel('Time');
ylabel('Amplitude');
legend('PPM Modulated Signal ---->');
grid on;
ylim([-0.2 1.2]);
```

BPF

```
clc;
clear ;
close all;
%% High Pass Filter
w=0:0.001:1000;
G1=(j*w)./(1+j*w);
subplot(3,1,1);
semilogx(w,abs(G1));
grid on;
xlabel('Frequency');
ylabel('Gain');
title('High Pass Filter Response');
%% Low Pass Filter
 G2=1./(1+j*w);
 subplot(3,1,2);
 semilogx(w,abs(G2),'g');
 grid on;
 xlabel('Frequency');
 ylabel('Gain');
 title('Low Pass Filter Response');
 %% Band PAss Filter
 G=G1.*G2;
 subplot(3,1,3);
 semilogx(w,abs(G),'m');
 grid on;
 xlabel('Frequency');
 ylabel('Gain');
 title('Band Pass Filter Response')
```

FM

```
clc
clear
close all
Kf=input("Enter the deviation factor");
Am=5;
Fm=10;
B=(Kf*Am)/Fm;
t=linspace(0,1,500); %generate linear space vector
Ac=2;
Fc=20;
sfm=Ac*cos((2*pi*Fc*t)+B*sin(2*pi*Fm*t));
mt=Am*cos(2*pi*Fm*t);
ct=Ac*cos(2*pi*Fc*t);
subplot(4,1,1)
plot(mt);
subplot(4,1,2)
plot(ct);
subplot(4,1,3)
plot(sfm);
x=diff(sfm);
y=abs(x);
[b,a]=butter(10,0.056);
s=filter(b,a,y);
subplot(4,1,4)
plot(s);
```

Exp 1: AM

```
clc;
close all;
clear all;
m=0.4;
Am=10;
fm=800;
Tm=1/fm;
t=0:Tm/999:6*Tm;
ym=Am*sin(2*pi*fm*t);
figure(1)
subplot(4,1,1);
plot(t,ym), grid on;
title ( ' Modulating Signal ');
xlabel ( ' time(sec) ');
ylabel (' Amplitud(volt) ');
Ac=Am/m;
fc=fm*15;
Tc=1/fc;
yc=Ac*sin(2*pi*fc*t);
subplot(4,1,2);
plot(t,yc), grid on;
title ( ' Carrier Signal ');
xlabel ( ' time(sec) ');
ylabel (' Amplitud(volt) ');
y=Ac*(1+m*sin(2*pi*fm*t)).*sin(2*pi*fc*t);
subplot(4,1,3);
plot(t,y);
title ( ' Amplitude Modulated signal ');
xlabel ( ' time(sec) ');
ylabel (' Amplitud(volt) ');
```

```
grid on;
d=(1/pi)*(Ac+ym);
subplot(4,1,4);
plot(t,d);
title ( ' Amplitude Demodulated signal ');
xlabel ( ' time(sec) ');
ylabel (' Amplitud(volt) ');
grid on;
```

PM

```
clc
clear
close all
Kp=input("Enter the deviation factor");
fm=5;
fc=20;
t=0:0.0001:1;
xm=cos(2*pi*fm*t);
xc=cos(2*pi*fc*t);
ypm=cos(2*pi*fc*t + Kp*xm);
subplot(3,1,1)
plot(t,xm);
title('Message Signal');
xlabel('Time');
ylabel('Amplitude');
grid on;
subplot(3,1,2)
plot(t,xc);
title('Carrier Signal');
xlabel('Time');
ylabel('Amplitude');
grid on;
subplot(3,1,3)
plot(t,ypm,t,xm);
title('Phase Modulated Signal');
xlabel('Time');
ylabel('Amplitude');
grid on;
```

PAM

```
clc;
clear all;
fc = 220;
fm = fc/8;
fs =
100*fc;
t=0:1/fs:4/fm;
%MESSAGE SIGNAL
Am = cos(2*pi*fm*t);
%CARRIER SIGNAL
Ac = 0.5*square(2*pi*fc*t)+0.5;
%PULSE AMPLITUDE MODULATED SIGNAL
Apam = Am.*Ac;
%GRAPH PLOTTING
subplot(3,1,1);
plot(t,Am);
title('MESSAGESIGNAL');
xlabel('TIME PERIOD');
ylabel('AMPLITUDE');
subplot(3,1,2);
plot(t,Ac);
title('CARRIER
SIGNAL'); xlabel('TIME
PERIOD');
ylabel('AMPLITUDE');
subplot(3,1,3);
plot(t,Apam);
title('PULSE AMPLITUDE
MODULATEDSIGNAL');
xlabel('TIME PERIOD');
```

```
ylabel('AMPLITUDE');
```