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REGISTRATION NO.: 19BEC1278

EXP. NO: 5

PHASE MODULATION AND DEMODULATION

AIM: Write a MATLAB program to execute and display the output for Phase modulation and demodulation.

SOFTWARE REQUIRED: MATLAB

THEORY:

PM is a type of angle modulation and it is defined as the change in phase of the carrier signal in correspondence with the amplitude of the message signal. Here, both the frequency and amplitude of the carrier signal stays as constant whereas phase varies in accordance. When there is a positive amplitude, the phase varies in one direction, while there is a negative amplitude, the phase varies in other directions.

If modulation signal $m(t)=Amcos(2\pi fmt)$ and carrier signal $c(t)=Accos(2\pi fct)$, then modulated signal $s(t)=Accos(2\pi fct+kpm(t))$ where,

Am: Amplitude of modulation signal
fm: Frequency of modulation signal
Ac: Amplitude of carrier signal
fc: Frequency of message signal
kp: phase sensitivity

ALGORITHM:

Step 1: Define the values for Am (message signal amplitude), Ac (carrier signal amplitude) ,fm (message signal frequency), fc (carrier signal frequency).
Step 2: Use the equation

- m=A*sin(2*pi*fm*t) to define the message signal
- C=A*sin(2*pi*fc*t) to define the carrier signal

Step 3: Use the pmmod() command to obtain phase modulated signal and the pmdemod() command to obtain the demodulated signal.

Step 4: Finally, save and click on Run to obtain the output graphs.

ALGORITHM:

Step 1: Define the values for Am (message signal amplitude), fm (message signal frequency), Ac (carrier signal amplitude), fc (carrier signal frequency) and m (modulation index).

Step 2: Use the equation

- m=Am*sin(2*pi*fm*t) to define the message signal
- C=Ac*sin(2*pi*fc*t) to define the carrier signal
- s=Ac*(1+ma*m).*sin(2*pi*fc*t) to define the modulated signal

Step 3: Use the pmmod() command to obtain phase modulated signal and the pmdemod() command to obtain the demodulated signal.

Step 4: Plot the message signal, carrier signal, modulated signal and demodulated signal in a single window using the subplot() command.

Step 5: Finally, save and click on Run to obtain the output graphs.

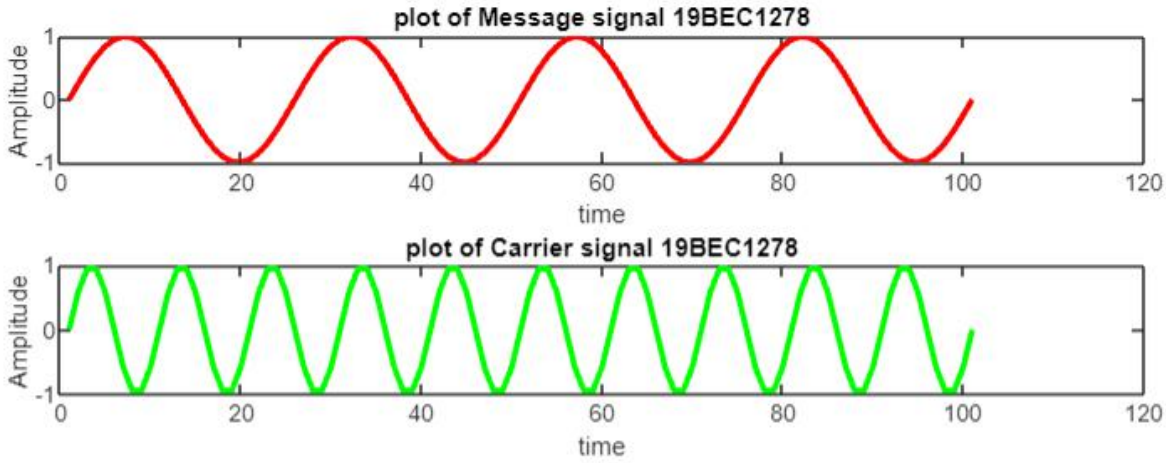
MATLAB CODE:

```
clc;
clear;
close all;
%% Message Signal
t=0:0.01:1;
fm=4;  %% message Signal Freq
Am=1;
msg = Am*sin(2*pi*fm*t);
subplot(4,1,1)
plot(msg,'r',LineWidth=2);
xlabel('time');
ylabel('Amplitude');
```

```
title('plot of Message signal 19BEC1278');
%% Carrier Signal
Ac=1;
t=0:0.01:1;
fc=10; %% carrier Signal Freq . must be higher than message signal freq
car = Ac*sin(2*pi*fc*t);
subplot(4,1,2)
plot(car,'g',LineWidth=2);
xlabel('time');
ylabel('Amplitude');
title('plot of Carrier signal 19BEC1278');

%% Phase Modulation using inbuilt Command
Fs=178;
tx = pmmod(msg,fc,Fs,phasedev);
subplot(4,1,3)
plot(tx,'k',LineWidth=2);
xlabel('time');
ylabel('Amplitude');
title('plot of Modulated signal (Using inbuilt Cmd) 19BEC1278 ');
%% Phase De-Modulation using inbuilt Command
Z = pmdemod(tx, fc, Fs,phasedev); %% Y is the Modulated signal from Previous
subplot(4,1,4)
plot(Z,'m',LineWidth=2);
xlabel('time');
ylabel('Amplitude');
title('plot of DeModulated signal (Using inbuilt Cmd)19BEC1278 ');
```

OUTPUT


plot of Message signal 19BEC1278
Amplitude
time
plot of Carrier signal 19BEC1278
Amplitude
time

INFERENCE:

The PM modulated and demodulated signal was generated using in built commands.