EXPERIMENT - 6 [U19CS012]

ASK, FSK and PSK

AIM: To study Amplitude Shift keying (A.S.K.), Frequency Shift keying (F.S.K.) and phase shift keying (P.S.K) modulation Technique and verify waveforms.

APPARATUS: MATLAB

THEORY: 1.) Modulation: Modulation is a process, by which some characteristics of a carrier wave is varied in accordance with a modulating (message) signal.

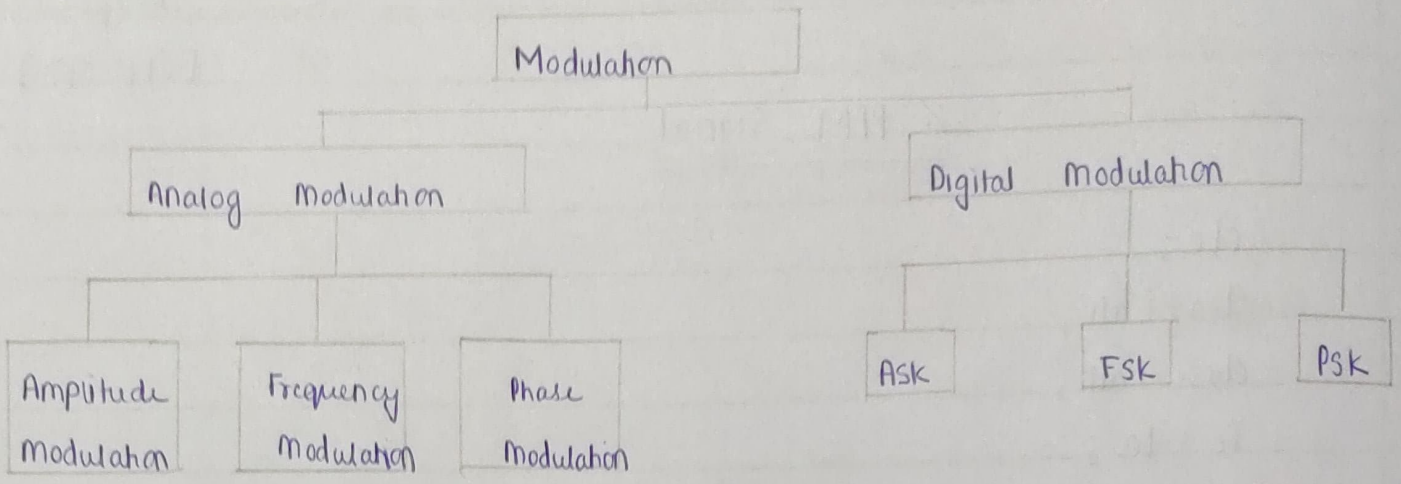
Digital modulation: It is a special kind of modulation, where the message signal is digital in nature and the carrier wave is analog (sinusodial) in nature.

The ASK, FSK and PSK are analogous to AM, FM and PM respectively. The difference is that in digital modulation techniques (ASK, FSK and PSK) the modulation signal is digital in nature. while in AM, FM and PM modulating signal is analog in nature.

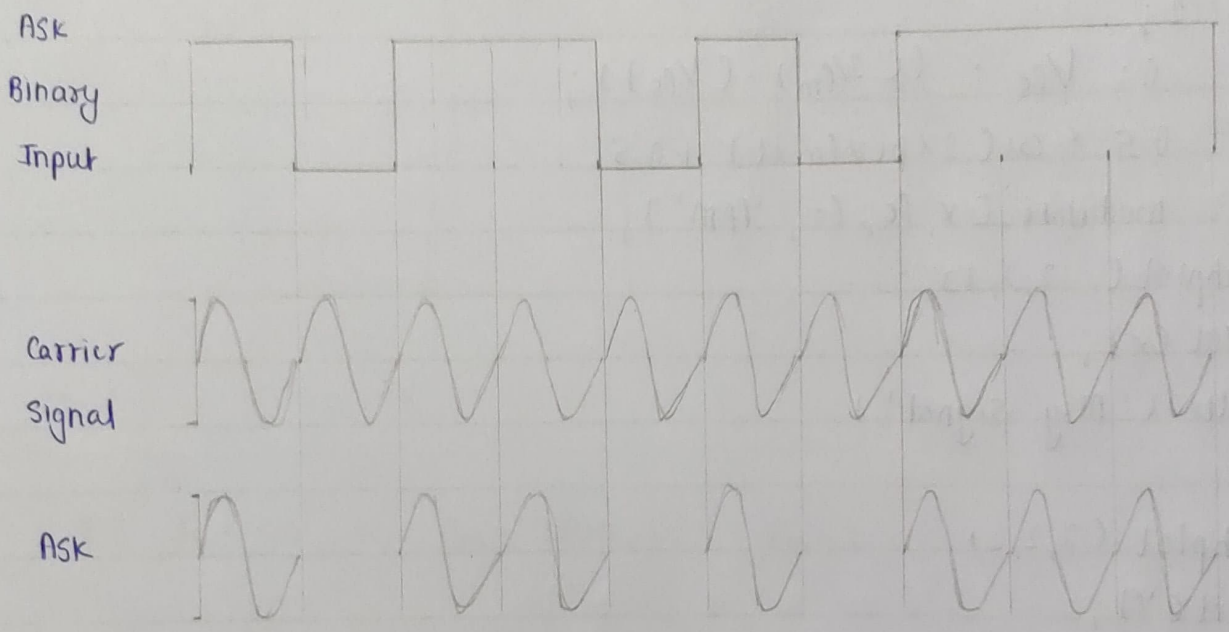
2.) ASK (Amplitude Shift keying)

In ASK, the amplitude of the carrier wave is changed (switched) according to the digital input signal (modulating signal)

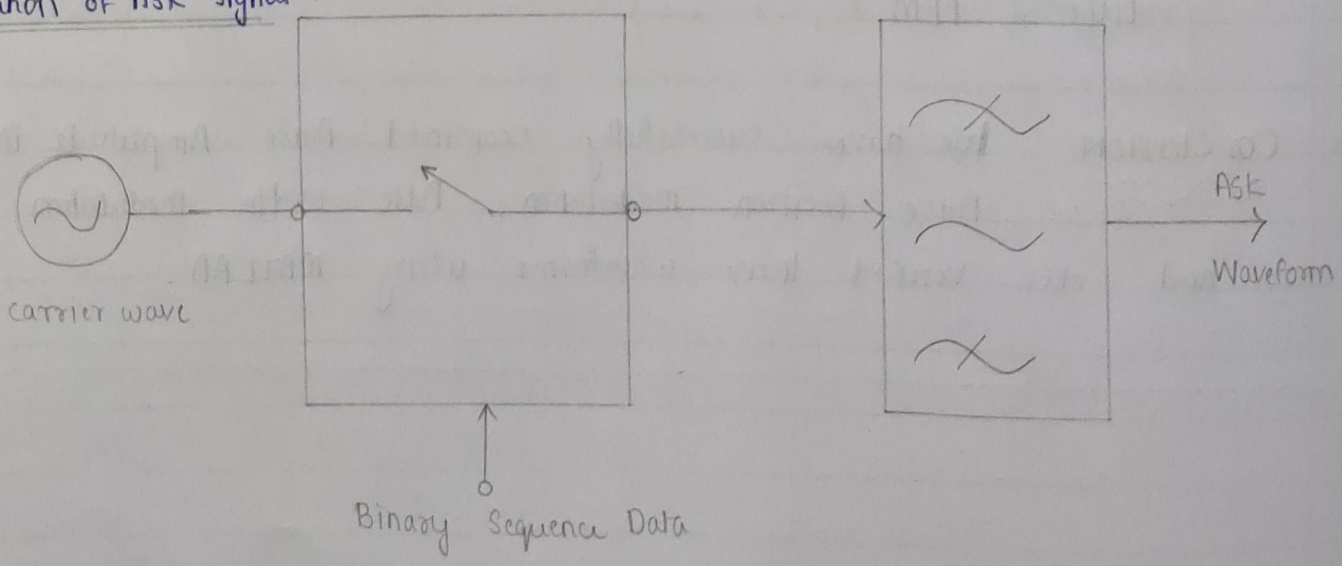
Teacher's Signature:



ASK



Generation of Ask signal :



Application of ASK : 1.) Wireless Base station
2.) Low Frequency RF Application
3.) ~~Instru~~ Industrial Network Devices

3.) FSK (Frequency Shift keying)

→ If the frequency of sinosoidal carrier wave is varied (switched) depending on the digital input signal, then it is known as the frequency shift keying.

→ Application of FSK :-

1. High Frequency Radio Transmission

4.) PSK (Phase Shift keying)

In PSK, phase of the carrier wave (analog in nature) is switched as per the input digital signal.

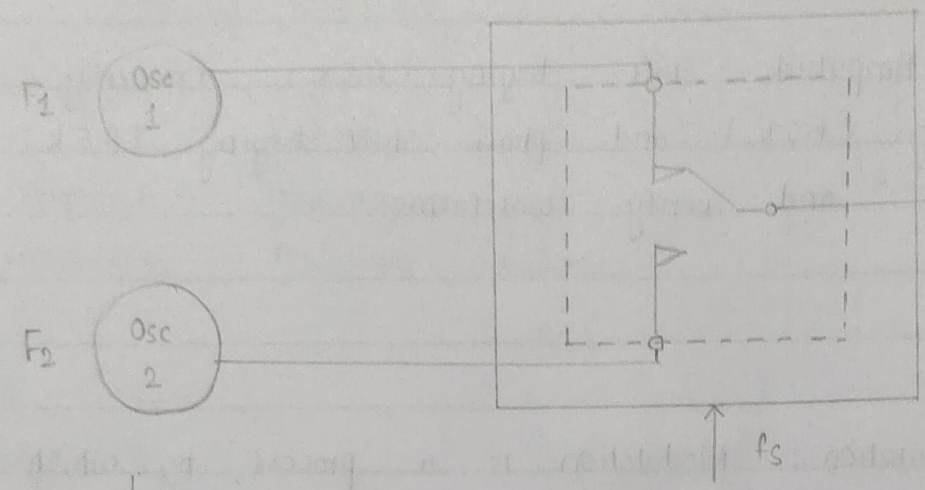
Application of PSK :

1. It is widely used for wireless LANs, RFID and Bluetooth communication.

Teacher's Signature:

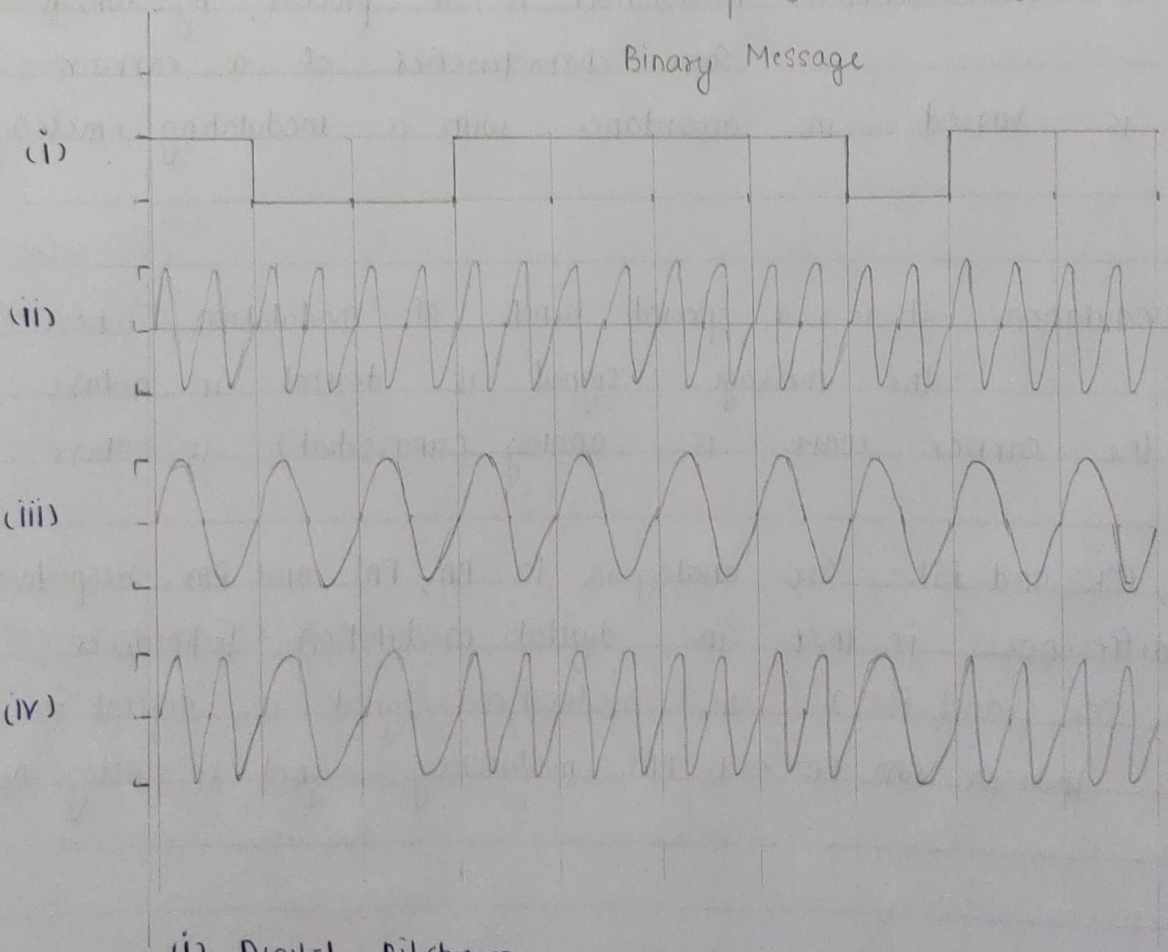
FSK

Generation of FSK



$F_1 \cong F_2$

Bit rate $F_s \ll F_1$



(i) Digital Bitstream

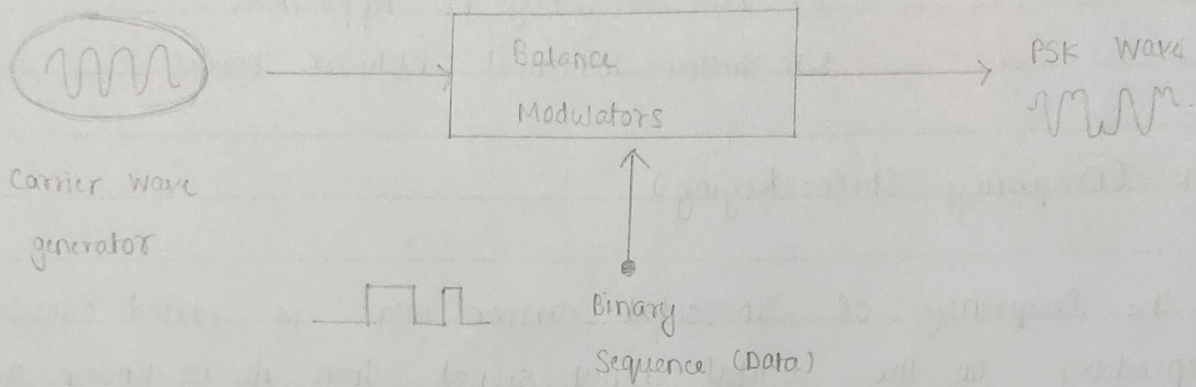
(ii) High frequency carrier wave

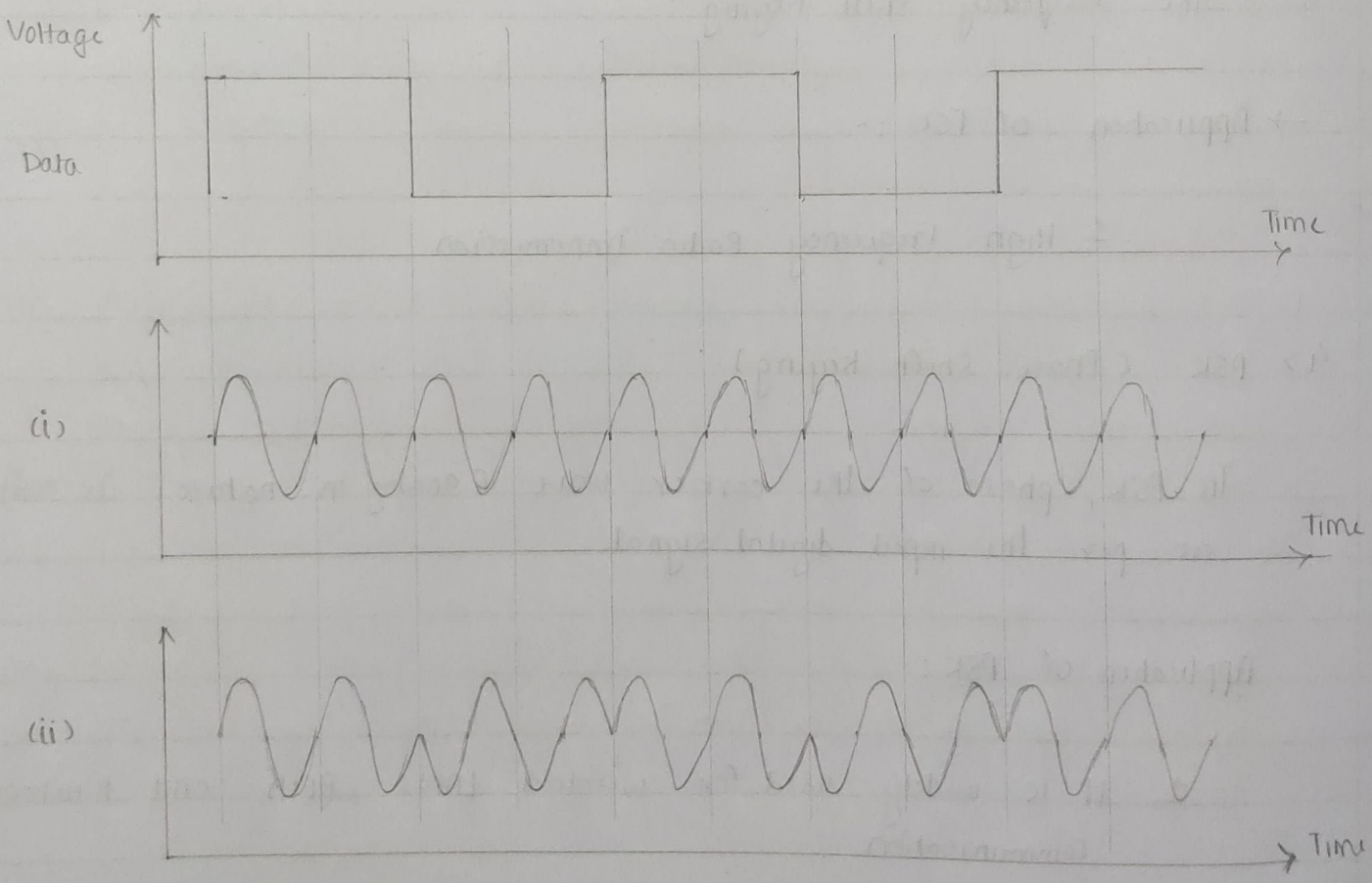
(iii) Low frequency carrier wave

(iv) Fsk modulated wave

PSK

Generation of PSK





(i) Carrier Frequency Before Modulation

(ii) Carrier Frequency After Modulation

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MATLAB CODE : %% ASK

```
clc; close all; clear all; % for deleting all variables from memory
fc = input('Enter the freq of Sine wave carrier:');
fp = input('Enter the freq of Periodic Binary pulse (message):');
amp = input('Enter the amplitude (For carrier & Binary Pulse message):');

t = 0:0.001:1; % for setting the sampling interval
c = amp. * sin(2*pi*fc*t); % for Generating carrier sine wave

subplot(3,1,1) % For Plotting Carrier Wave
plot(t,c)
xlabel('Time')
ylabel('Amplitude')
title('carrier wave')
m = amp/2 . * square(2*pi*fp*t) + (amp/2); % Square wave msg
subplot(3,1,2) % Plotting Square Binary Pulse
plot(t,m)
xlabel('Time')
ylabel('Amplitude')
title('Binary Message Pulses')
w = c*m % The Shift Keyed wave
subplot(3,1,3) % for plotting ASK wave
plot(t,w)
xlabel('Time')
ylabel('Amplitude')
title('Amplitude Shift keyed Signal')
```

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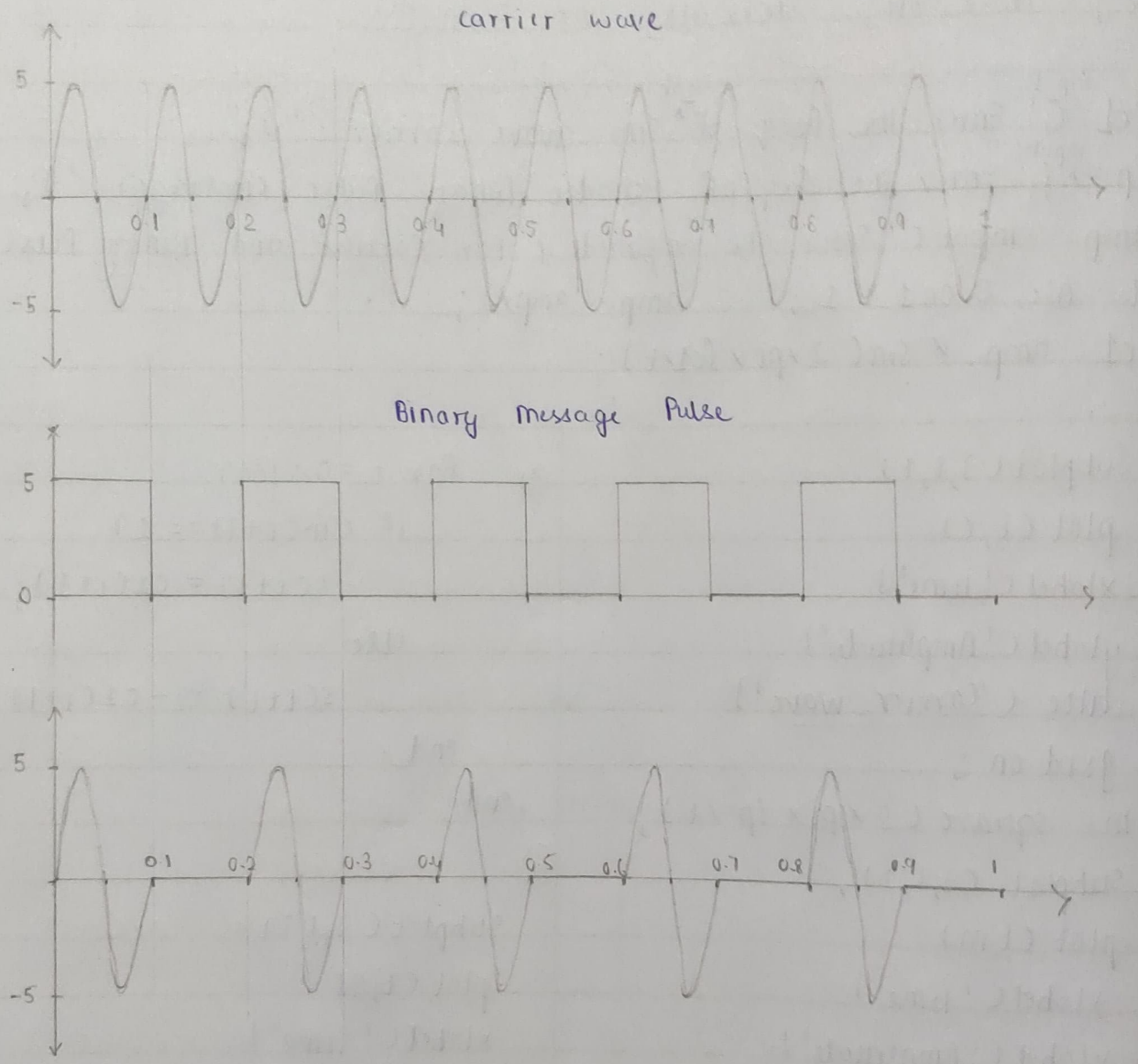
(A) ASK :

3.) $F_c = 10\,Hz$ $F_p = 5\,Hz$ Amp = 5



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%% FSK

```
clc; close all; clear all;
fc1 = input('Enter the freq of 1st sine wave carrier: ');
fc2 = input('Enter the freq of 2nd sine wave carrier: ');
fp = input('Enter the freq of Periodic Binary pulse (message): ');
amp = amp/2;
t = 0: 0.001 : 1;
c1 = amp. * sin (2*pi* fc1*t);
c2 = amp. * sin (2*pi* fc2*t);
```

①
```
subplot(4,1,1);
plot(t, c1)
xlabel('Time')
ylabel('Amplitude')
title('carrier 1 wave')
```

②
```
subplot(4,1,2);
plot(t, c2)
xlabel('Time')
ylabel('Amplitude')
title('carrier 2 wave')
```

③
```
m = amp. * square (2*pi*fp*t) + amp; % square wave form
subplot(4,1,3)
plot(t,m)
xlabel('Time')
ylabel('Amplitude')
title('Binary message Pulses')
```

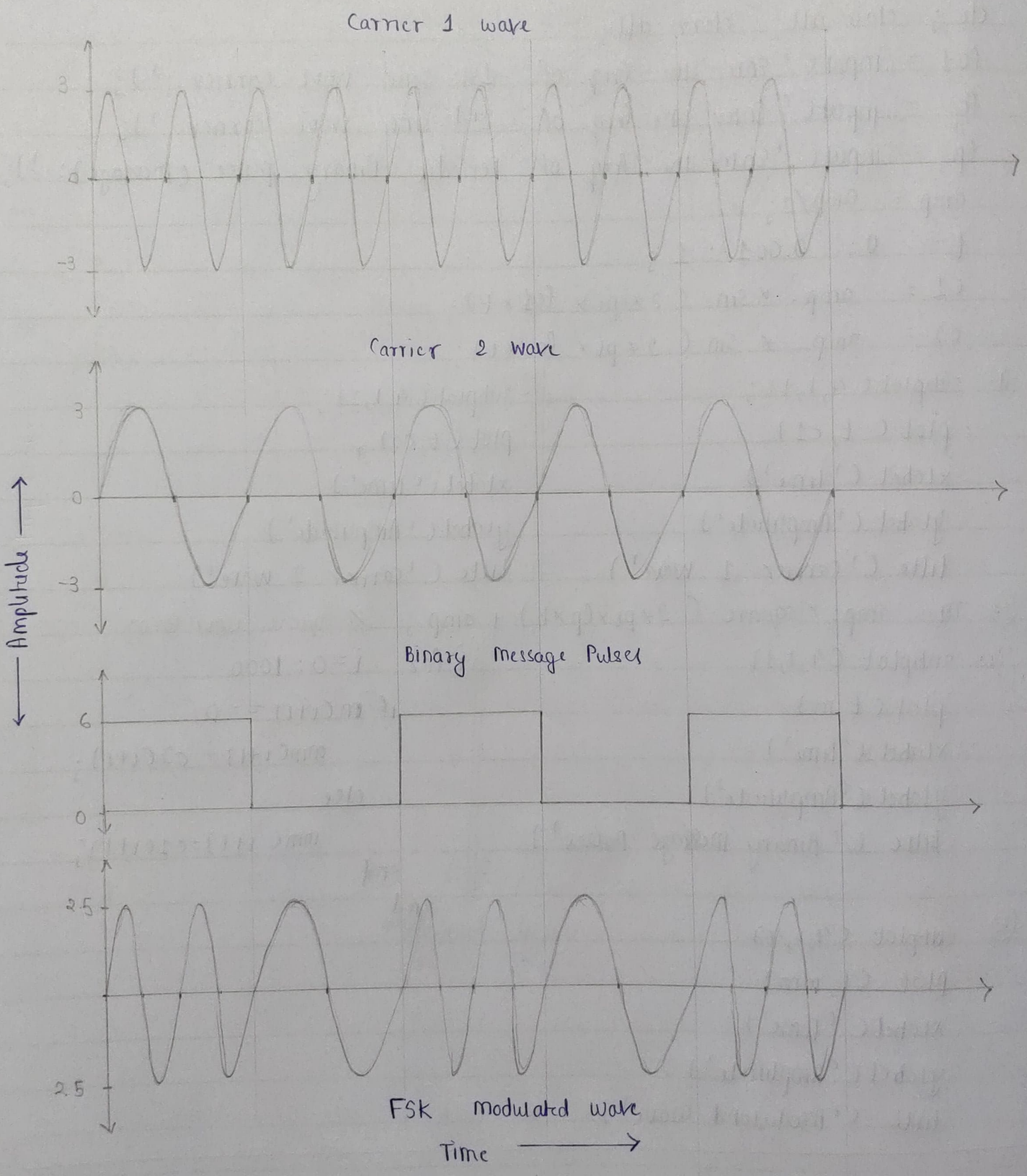
④
```
for i=0:1000
    if m(i+1)==0
        mm(i+1) = c2(i+1);
    else
        mm(i+1)=c1(i+1);
    end
end
```

⑤
```
subplot(4,1,4)
plot(t, mm)
xlabel('Time')
ylabel('Amplitude')
title('Modulated Wave')
```

Teacher's Signature:

FSK :

2.) $F_{c1} = 30$ $F_{c_2} = 10$ $F_p = 5$ amp = 6



%% PSK

```
clc; close all; clear all;
fc1=input('Enter the freq of 1st sine wave carrier:');
fp=input('Enter the freq of Periodic Binary Pulse (message):');
amp = input('Enter the amplitude ( For Carrier and Binary Pulse Message)');
t = 0 : 0.001 : 1;      amp= amp/2;
c1= amp.* sin( 2*pi*fc1*t);
```

①
```
Subplot(3,1,1)
plot(t,c)
xlabel('Time')
ylabel('Amplitude')
title('Carrier wave')
grid on;
m = square(2*pi*fp*t);
```

②
```
subplot(3,1,2),
plot(t,m)
xlabel('Time')
ylabel('Amplitude')
title('Binary Message Pulses')
s = c*m      grid on
subplot(3,1,3)
```

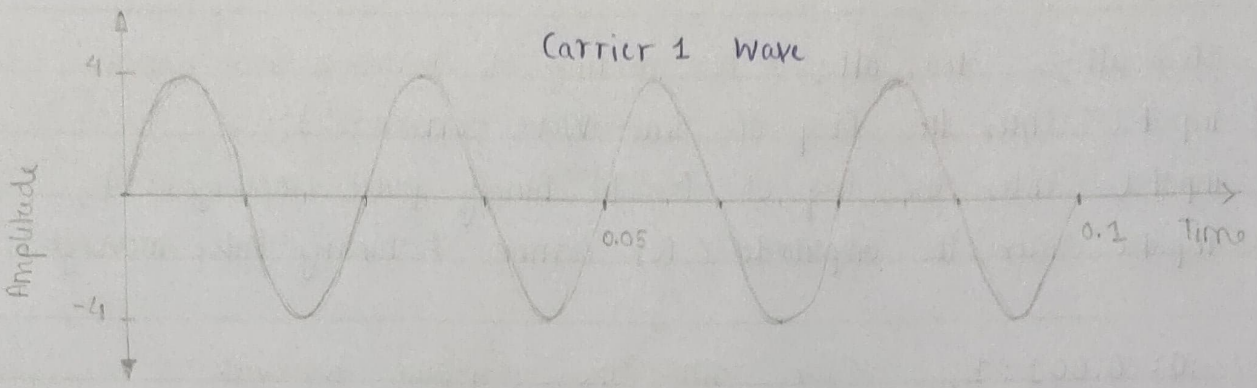
③
```
for i=0:1000
    if(m(i+1)==1)
        s(i+1) = c1(i+1);
    else
        s(i+1) = -c1(i+1);
    end
end
```

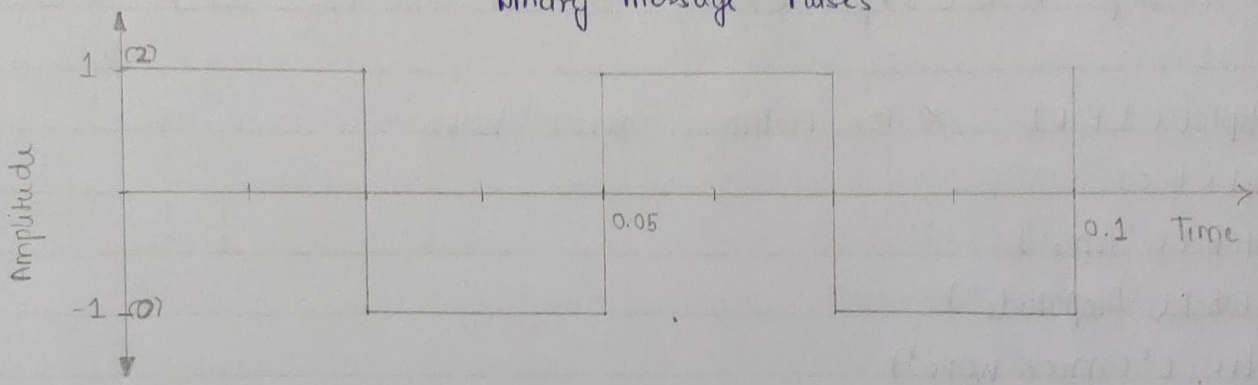
④
```
subplot(3,1,3)
plot(t,s)
xlabel('Time')
ylabel('Amplitude')
title('modulated wave')
grid on.
```

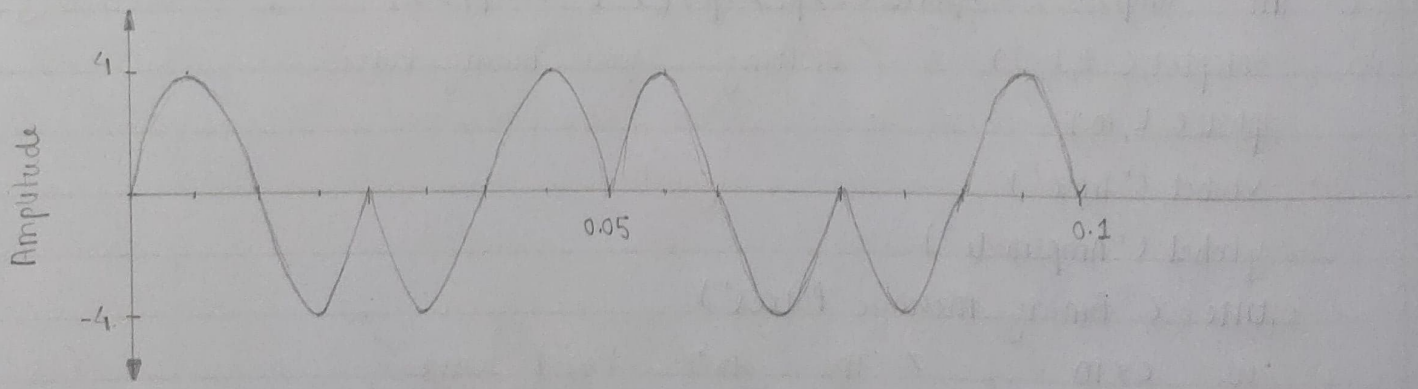
Teacher's Signature:

Waveforms using MATLAB

PSK : 1.) $F_{c1} = 40\,Hz$ $F_p = 20\,Hz$ $Amp = 8\,V$







Modulated Wave

[U19CS012]

CONCLUSION :

1) We have successfully studied ASK, PSK and FSK modulation technique and verified their waveforms using MAILAB. We also observed the schematic diagrams for ASK, FSK & PSK.

Teacher's Signature: