D.Y. PATIL INTERNATIONAL UNIVERSITY
B.TECH CSE FY SEM-2
A.Y. 2022-2023

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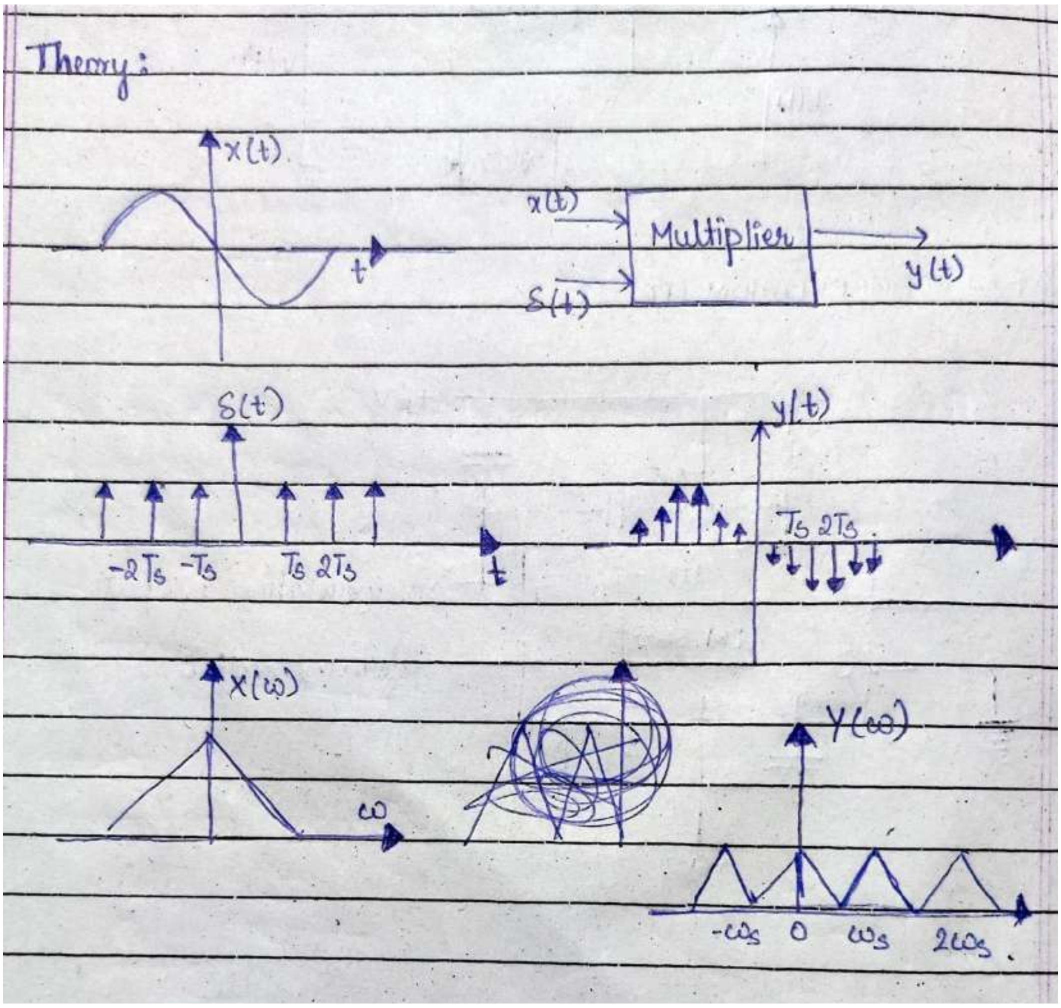
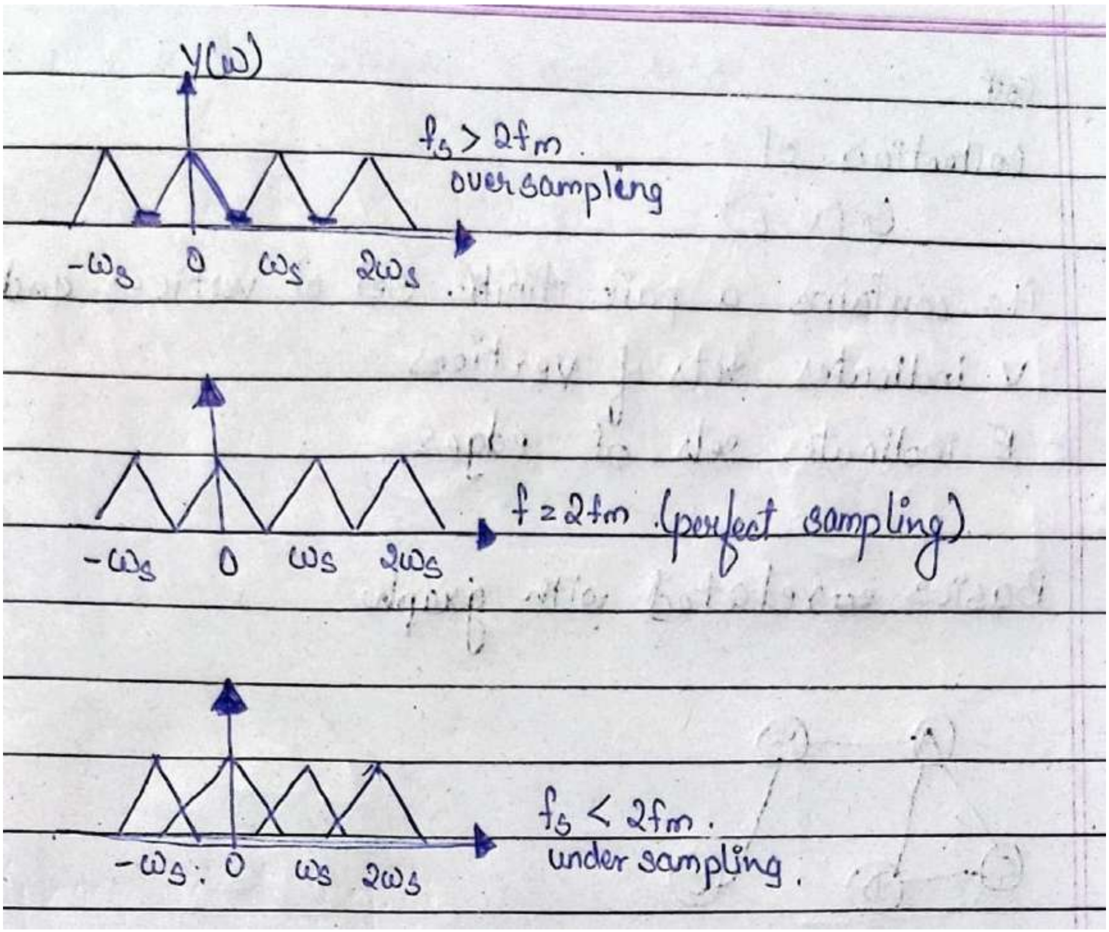
SUBJECT: INTRODUCTION TO COMMUNICATION SYSTEMS
BATCH: A1

EXPERIMENT: 07

TITLE: Sampling Theorem
APPARATUS: Matlab Simulink and Matlab Code
DRAW THE WAVEFORM:





Explanation:

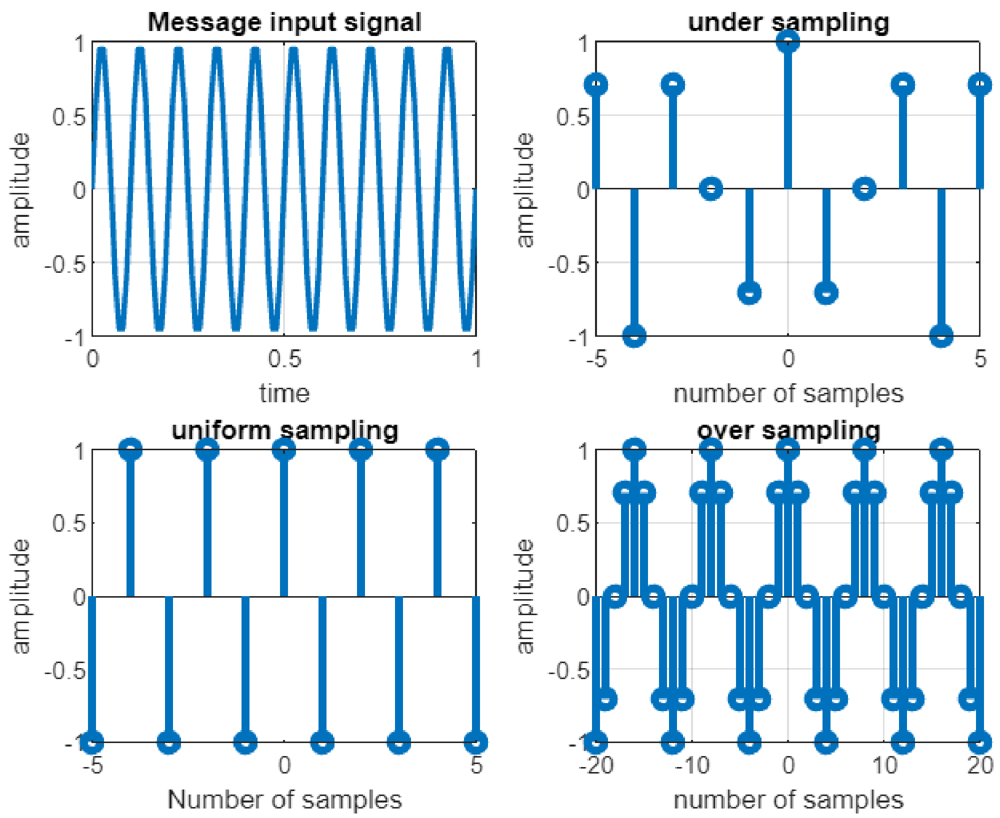
A continuous time signal can be represented in its samples and can be recovered back when sampling frequency fs is greater than or equal to the twice the highest frequency component of message signal. i. e.$f_s \geq 2f_m$.

Matlab CODE:

```
%sampling

close all;
clc;
t=0:0.01:1; % Time Vector
fm=10; % Message (Input) signal amplitude
Am=1; % (Input) signal amplitude

x=Am*sin(2*pi*fm*t); % Message signal
subplot(2,2,1);
plot(t,x,'linewidth',2);
xlabel('time');
ylabel('amplitude');
grid;
title('Message input signal');

n1=-5:1:5;
fs1=1.6*fm;
fs2=2*fm;
fs3=8*fm;

x1=Am*cos(2*pi*fm/fs1*n1);
```

```
subplot(2,2,2);
stem(n1,x1,'linewidth',3);
xlabel('number of samples');
ylabel('amplitude');
grid on;
title('under sampling');

n2=-5:1:5;
x2=cos(2*pi*fm/fs2*n2);
subplot(2,2,3);
stem(n2,x2,'linewidth',3);
xlabel('Number of samples');
ylabel('amplitude');
hold on;
title('uniform sampling');

n3=-20:1:20;
x3=cos(2*pi*fm/fs3*n3);
subplot(2,2,4);stem(n3,x3,'linewidth',3);
hold on;
xlabel('number of samples');
ylabel('amplitude');
grid;
title('over sampling');
fprintf("Sarwajeet Pratap Singh");
```

OUTPUT:



Experiment: 08

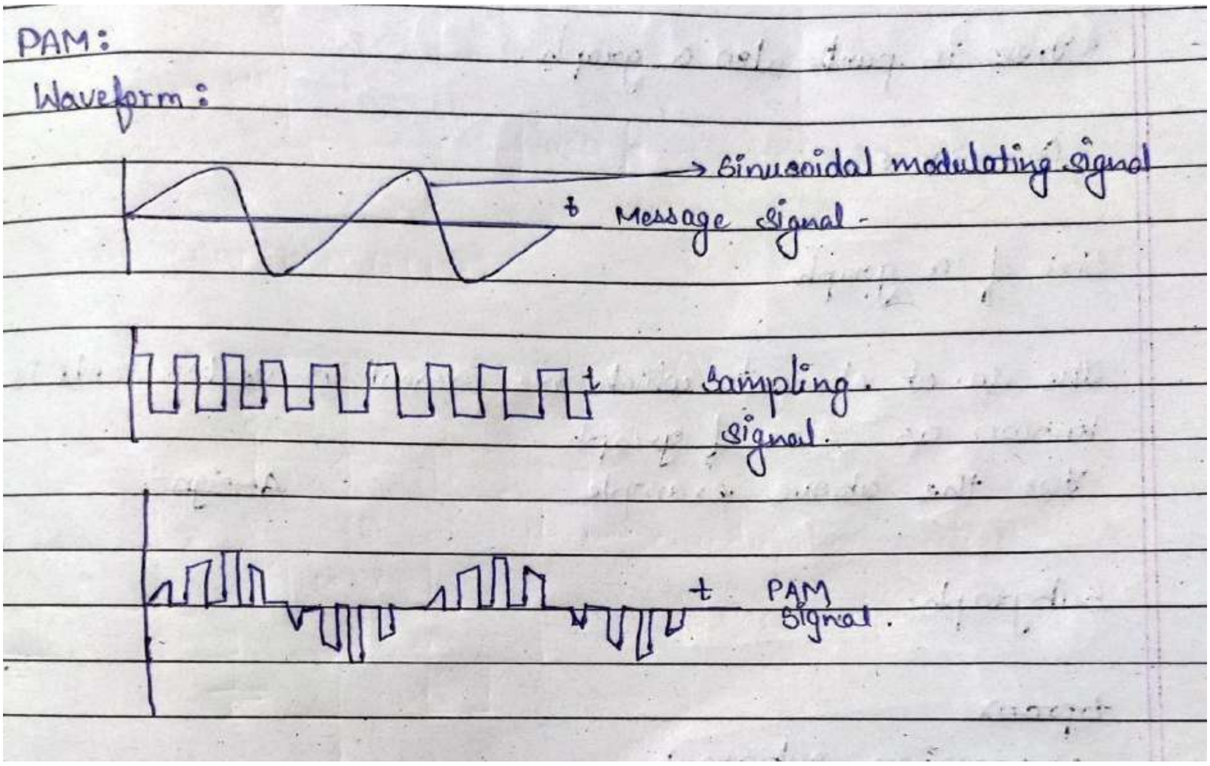
TITLE: PAM Generation and reconstruction

APPARATUS: Matlab Simulink and Matlab Code

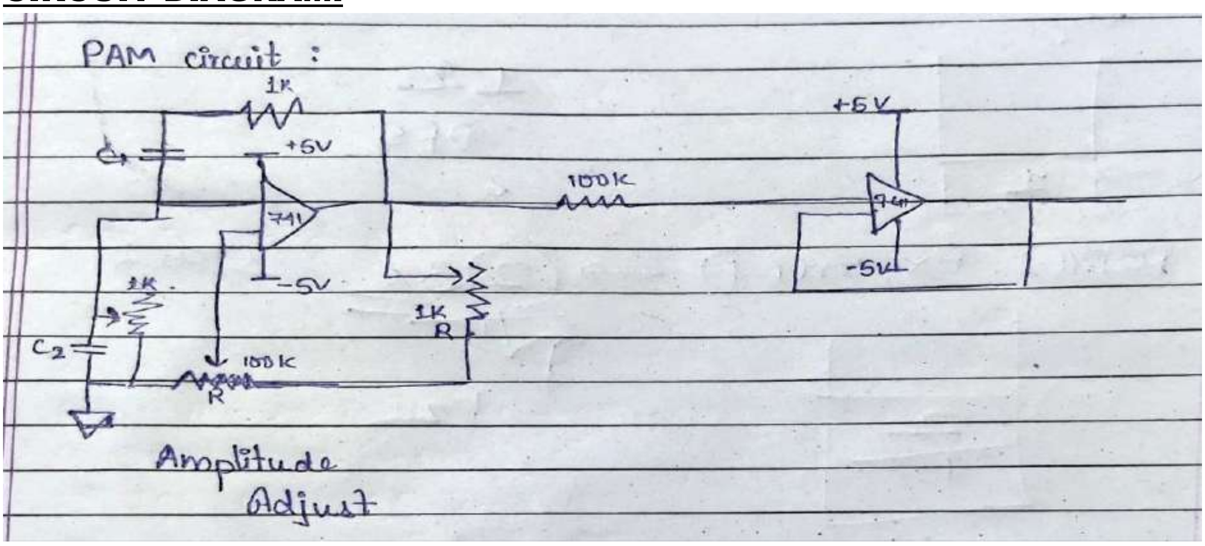
EXPLANATION:

- Pulse amplitude modulation is a technique in which the amplitude of each pulse is controlled by the instantaneous amplitude of the modulation signal.
- It is a modulation system in which the signal is sampled at regular intervals and each sample is made proportional to the amplitude of the signal at the instant of sampling.
- This technique transmits the data by encoding in the amplitude of a series of signal pulses.

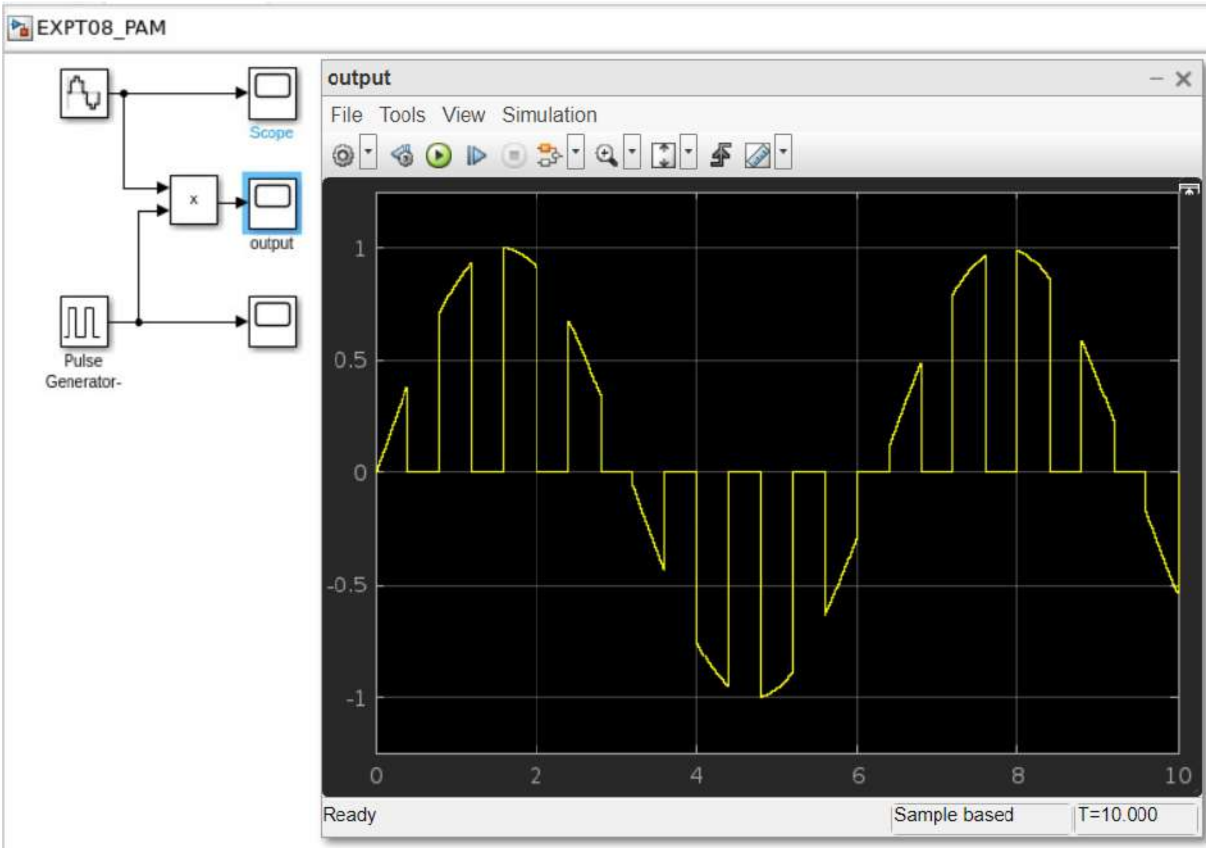
WAVEFORM:



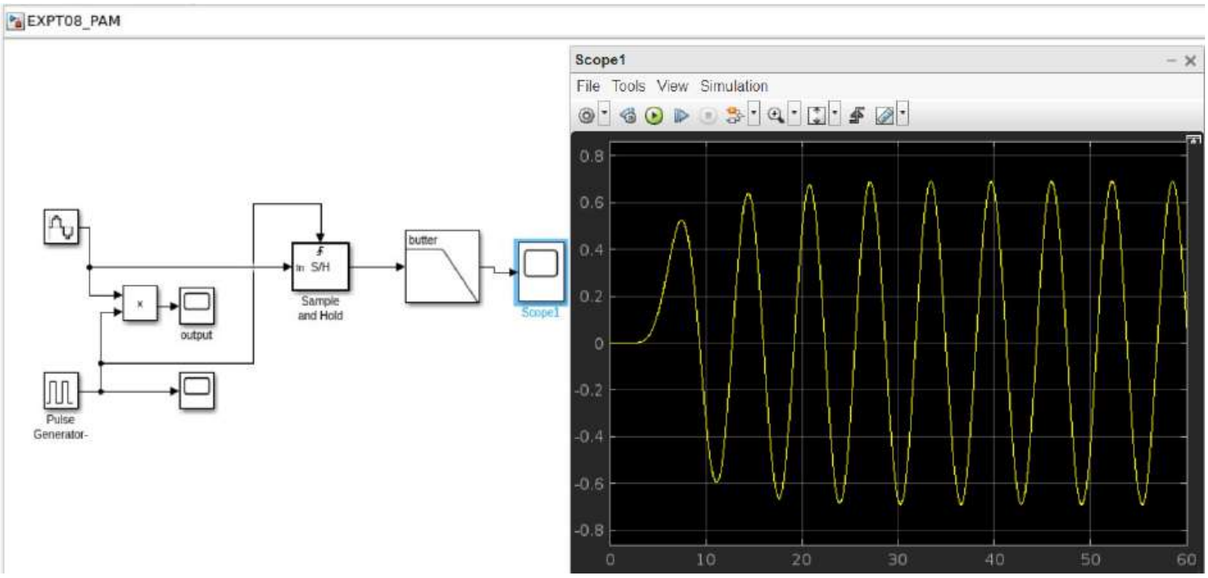
CIRCUIT DIAGRAM:



MATLAB SIMULINK:



DEMODULATION:



MATLAB CODE:

```
clc;

am = input('Enter the amplitude:');
fm= input('Enter frequency:');
t = 0:0.02:2;
x = 1;
subplot(3,1,1);
stem(x);
xlabel('Time');
```

```
ylabel('Amplitude');
title('Impulse Signal');

x2 = am*sin(2*pi*fm*t);

subplot(3,1,2);
title('Sinusoidal Signal');
plot(t,x2);
ylim([-a-0.2 a+0.2]);
xlabel('Time');
ylabel('Amplitude');

y = x.*x2;
subplot(3,1,3);
title('PAM Waveform');
stem(t,y);
xlabel('Time');
ylabel('Amplitude');
ylim([-a-0.2 a+0.2]);
fprintf("Sarwajeet Pratap Singh");
```

OUTPUT: