Assignment – 04

COMMUNICATION FOUNDATION LAB
EC-14206

Submitted By :-

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Objective: To perform Pulse Modulation and demodulation through coding.

Tools used: MATLAB

Theory :-

In Pulse Amplitude Modulation (PAM) technique, the amplitude of
the pulse carrier varies, which is proportional to the instantaneous
amplitude of the message signal.
The pulse amplitude modulated signal will follow the amplitude of the
original signal, as the signal traces out the path of the whole wave.
In natural PAM, a signal sampled at Nyquist rate can be reconstructed, by passing it through an efficient Low Pass Filter
(LPF) with exact cutoff frequency.
Pulse-amplitude modulation is widely used in modulating signal transmission of digital data, with non-baseband applications
having been largely replaced by pulse-code modulation, and, more recently, by pulse-position modulation.

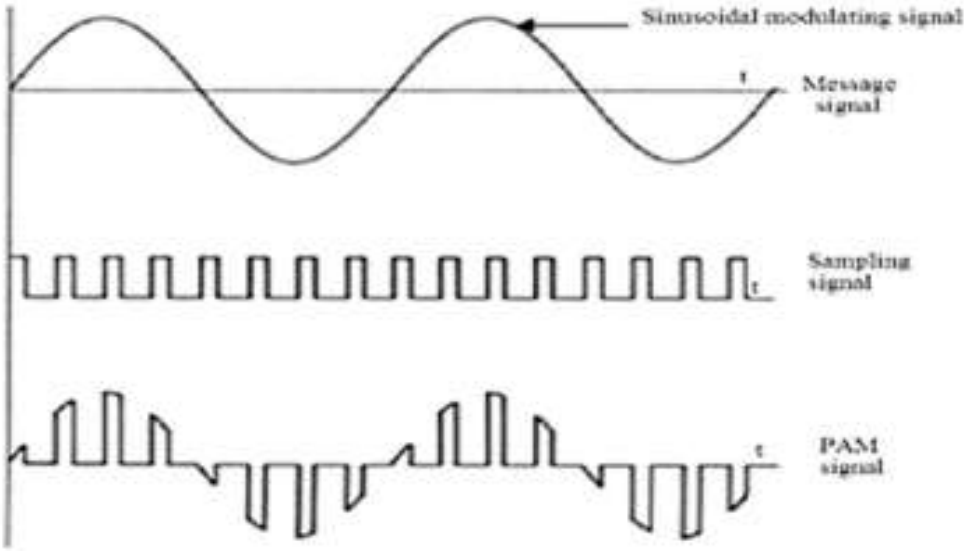


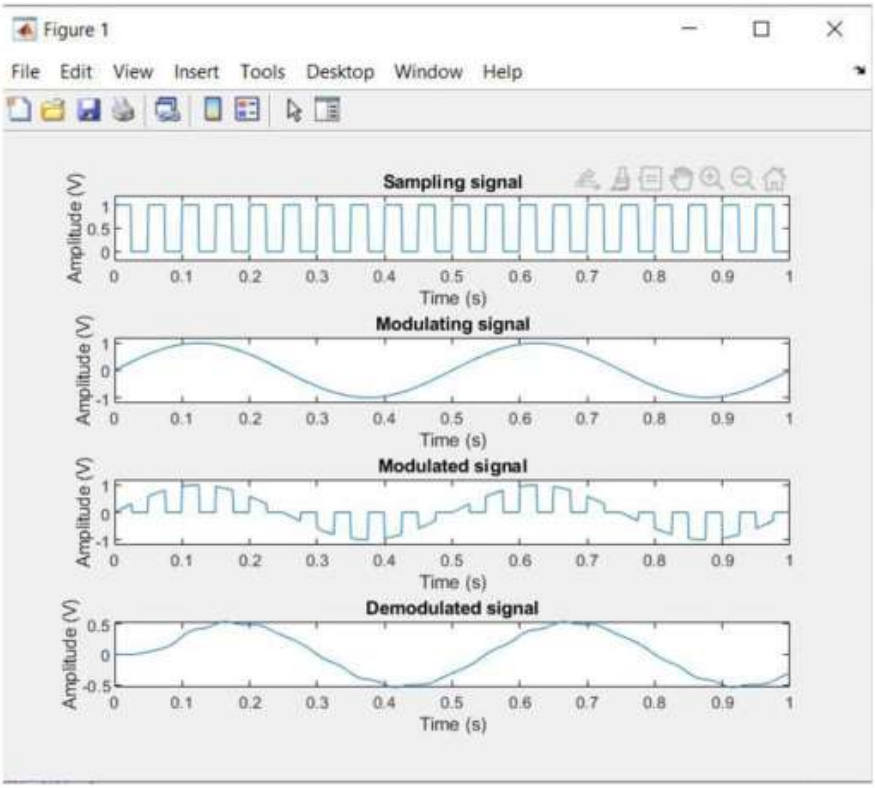
Fig 1. Generation of PAM

MATLAB code :-

```
clc;
fc = 20;
fm =2;
fs = 1000;
t=1;
n = [0:1/fs:t];
n = n(1:end-1);
dutycycle = 50;
s = square(2*pi*fc*n,dutycycle);
s(find(s<0))=0; %to make it unipolar
m = sin(2*pi*fm*n);
period_sam = length(n)/fc; %to find the number of samples in one
period
ind = 1:period_sam:length(n); %to find the starting sample index
on_samp = ceil(period_sam * dutycycle/100); %no. of samples in on
period of time
pam = zeros(1,length(n));
for i =1:length(ind)
pam(ind(i):ind(i)+on_samp) = m(ind(i):ind(i)+on_samp);
end
[b,a]=butter(5,0.02); DPAM=filter(b,a,pam);
subplot(4,1,1);
plot(n,s);
title('Sampling signal');
xlabel('Time (s)')
ylabel('Amplitude (V)')
ylim([-0.2 1.2]);
subplot(4,1,2);
plot(n,m);
title('Modulating signal');
xlabel('Time (s)')
ylabel('Amplitude (V)')
ylim([-1.2 1.2]);
subplot(4,1,3);
plot(n,pam);
title('Modulated signal');
xlabel('Time (s)')
ylabel('Amplitude (V)')
ylim([-1.2 1.2]);
subplot(4,1,4);
plot(n,DPAM);
title('Demodulated signal');
xlabel('Time (s)')
ylabel('Amplitude (V)')
```

Output :-

Executing the above code, gave the following output,



Result :-

The above graphs of modulated and demodulated signals is obtained.

Conclusion :-

Pulse modulation is a technique in which the amplitude of each pulse is controlled by the instantaneous amplitude of modulation signal.

Applications :-

1. Ethernet communication
2. Micro-controllers
3. Electronic driver for LED lighting