Cosmos College of Management and Technology

Subject: Principle of Communications

Lab-3

Objective:

- To plot various graphs that illustrate Fourier Series Theory

1. Fourier Series

1. Write a program that plots the signal **s(t) =** $\sum_{n=1}^{N} \frac{\sin(2\pi nt)}{n}$; where n=1,3,5,7,9 and N=9.

Program Code:

```
%Write a program that plots the signal s(t) =sin(2πt)+sin(6πt)/3+sin(10πt)/5
%+sin(14πt)/7+sin(18πt)/9.
clear all;
close all;
t=linspace(0,1,100);
f=1;
y=sin(2*pi*f*t)+sin(6*pi*f*t)/3+sin(10*pi*f*t)/5
  +sin(14*pi*f*t)/7+sin(18*pi*f*t)/9;
plot(t,y);
xlabel('Time');
ylabel('Amplitude');
title('Fourier Series with N=9');
```

2. Write a program that plots the signal **s(t) =** $\sum_{n=1}^{N} \frac{\sin(2\pi nt)}{n}$; where N=100.

Program Code:

```
clear all;
close all;
t=linspace(0,1,100);
f=1;
sumy=zeros(1,100);
for i=1:2:100
   y=sin(2*pi*i*f*t)/i;
   sumy=sumy+y;
end;
plot(t,sumy);
xlabel('Time');
```

```
ylabel('Amplitude');
title('Fourier Series with N=100');
```

Hence, it is concluded that with higher value of N, the signal becomes square wave signal i.e. square wave is the summation of different sinusoidal waves.

2. Other Signals

1. Write the program to plot a discrete-time square wave.

Program Code:

```
%Write the program to plot a discrete-time square wave
clear all;
close all;
t = 0:.001:.065;
f=30;
duty=50;
y = square(2*pi*f*t,duty);
stem(t,y);
xlabel('Discrete-time');
ylabel('Amplitude');
title('Square wave');
```

2. Write a program that plots a discrete time saw-tooth signal.

Program Code:

```
%Write a program that plots a discrete time saw-tooth signal
clear all;
close all;
t = 0:.001:.065;
f=92;
width=1;
y = sawtooth(2*pi*f*t,width);
plot(t,y);
xlabel('Discrete-time');
ylabel('Amplitude');
title('Sawtooth wave');
```

3. Write a program that plots a discrete time triangular pulse.

Program Code:

```
%Generate a Triangular pulse
clear all;
close all;
n=0:1:10;
a=[ones(1,6),zeros(1,5)];
k=a.*n;
stem(n,k);
hold on;
n1=10:-1:0;
a1=[zeros(1,5),ones(1,6)];
k1=n1.*a1;
stem(n,k1);
xlabel('Time');
ylabel('Amplitude');
title('Triangular Pulse');
```

3. SIMULINK

Objectives:

- To familiarize with SIMULINK
- To perform simulation examples in SIMULINK

Theory:

SIMULINK is a model analysis and construction functions.

Model: