THANGAL KUNJU MUSALIAR COLLEGE OF ENGINEERING

KOLLAM – 691 005

ELECTRONICS AND COMMUNICATION ENGINEERING

LABORATORY RECORD

YEAR 2024-25

Certified that this is a Bonafide Record of the work done by Sri. **MOHAMMED AADHIL M** *of* ***5th*** *Semester class (Roll No.* ***[B22ECB47N]*** ***Electronics and Communication*** *Branch) in the* ***Digital Signal Processing*** *Laboratory during the year* ***2024-25***

Name of the Examination: **Fifth Semester B. Tech Degree Examination 2024**

Register Number : **TKM22EC084**

Staff Member in-charge *External Examiner*

Date:

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Experiment No: 1 Date: 29/07/24 **Simulation of Basic Test Signals**

Aim:

To generate continuous and discrete waveforms for the following:

1. Unit Impulse Signal
2. Bipolar Pulse Signal
3. Unipolar Pulse Signal
4. Ramp Signal
5. Triangular Signal
6. Sine Signal
7. Cosine Signal
8. Exponential Signal

9. Unit Step Signal

Theory:

1.Unit Impulse Signal:

- A signal that is zero everywhere except at one point, typically at t=0 where its value is 1.
- **Mathematically** $\delta(t) = \begin{cases} \infty; t = 0 \\ 0; t \neq 0 \end{cases}$

2.Bipolar Pulse Signal:

- A pulse signal that alternates between positive and negative values, usually rectangular in shape. It switches between two constant levels (e.g., -1 and 1) for a defined duration.
- **Mathematically p(t) = A for $|t| \leq \tau/2$, p(t) = 0 otherwise**

3. Unipolar Pulse Signal:

- A pulse signal that alternates between zero and a positive value. It remains at zero for a specified duration and then jumps to a positive constant level (e.g., 0 and 1).
- **Mathematically p(t) = A for $|t| \leq \tau/2$, p(t) = 0 otherwise (assuming A is positive)**

4. Ramp Signal:

- A signal that increases linearly with time.
- **Mathematically** $r(t) = \begin{cases} t; t \geq 0 \\ 0; t < 0 \end{cases}$

5.Triangular Signal:

- A periodic signal that forms a triangle shape, linearly increasing and decreasing with time, typically between a positive and negative peak.
- **Mathematically: $\Lambda(t) = 1 - |t|$ for $|t| \leq 1$, $\Lambda(t) = 0$ otherwise**

6.Sine Signal:

- A continuous periodic signal. It oscillates smoothly between -1 and 1.
- **Mathematically: y(t)=Asin(2πft)**

7. Cosine Signal:

- A continuous periodic signal like the sine wave but phase-shifted by π\2.
- **Mathematically: y(t)=Acos(2πft)**

8. Exponential Signal:

- A signal that increases or decreases exponentially with time. The rate of growth or decay is determined by the constant a.
- **Mathematically: e^(at)**

9. Unit Step Signal:

- A signal that is zero for all negative time values and one for positive time values.
- **Mathematically** $u(t) = \begin{cases} 1; & t \geq 0 \\ 0; & t < 0 \end{cases}$

Program:

```
clc; clear
all; close
all;
subplot(3,
3,1); t =
-5:1:5; y
=
[zeros(1,5
),ones(1,1
```

```
),zeros(1,
5)];
stem(t,y);
xlabel("Ti
me(s)");
ylabel("Am
plitude");
title("Uni
t Impulse
Signal");
 subplot(3,3,2); t2 = 0:0.01:1;
f = 5; y2 = square(2*pi*f*t2);
stem(t2,y2); hold on;
plot(t2,y2); xlabel("Time(s)");
ylabel("Amplitude");
title("Bipolar Pulse Signal");
legend("Discrete","Continuous");
 subplot(3,3,3); t3 =
0:0.1:1; f = 5; y3 =
abs(square(2*pi*f*t3));
stem(t3,y3); hold on;
plot(t3,y3);
xlabel("Time(s)");
ylabel("Amplitude");
title("Unipolar Pulse
Signal");
legend("Discrete","Continuo
us");
 subplot(3,3,4); t4 = -5:1:5; y4
= t4 .*(t4>=0); stem(t4,y4);
```

```
hold on; plot(t4,y4);
xlabel("Time(s)");
ylabel("Amplitude"); title("Unit
Ramp Signal");
legend("Discrete","Continuous");
 subplot(3,3,5); t5 = 0:0.025:1;
f = 10; y5 =
sawtooth(2*pi*f*t5,0.5);
stem(t5,y5); hold on;
plot(t5,y5); xlabel("Time(s)");
ylabel("Amplitude");
title("Triangular Signal");
legend("Discrete","Continuous");
 subplot(3,3,6); t6
= 0:0.001:1; f = 10;
y6 = sin(2*pi*f*t6);
stem(t6,y6); hold
on; plot(t6,y6);
xlabel("Time(s)");
ylabel("Amplitude");
title("Sine Wave");
legend("Discrete","C
ontinuous");
 subplot(3,3,7); t7 = 0:0.001:1;
f = 10; y7 = cos(2*pi*f*t7);
stem(t7,y7); hold on;
plot(t7,y7); xlabel("Time(s)");
ylabel("Amplitude");
title("Cosine Wave");
legend("Discrete","Continuous");
```

```
 subplot(3,3,8); t8 = -5:1:5; y8
= exp(t8); stem(t8,y8); hold on;
plot(t8,y8); xlabel("Time(s)");
ylabel("Amplitude");
title("Exponential Signal");
legend("Discrete","Continuous");
subplot(3,3,9); t9 = -5:1:5; y9
= [zeros(1,5),ones(1,6)];
stem(t9,y9); xlabel("Time(s)");
ylabel("Amplitude"); title("Unit
Step Signal");
```

Result:

Generated and Verified various Continuous and Discrete waveforms for basic test signals.

Observation: