Lab 2: Signal generation and manipulation

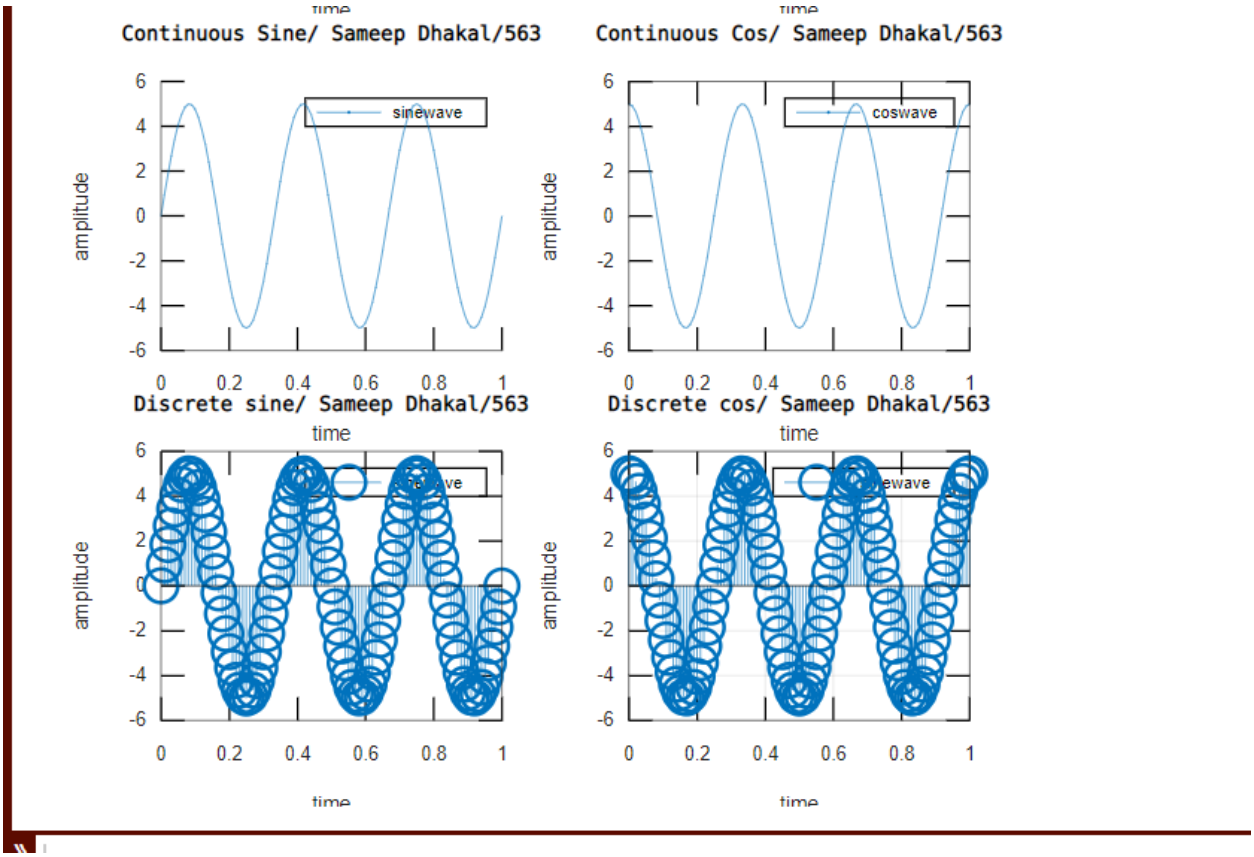
THEORY:

- Discrete time signal:
  - A discrete-time signal is a time series consisting of a sequence of quantities obtained by sampling continuous time signal.
- Continuous time signal:
  - A continuous-time (CT) signal is a function, s(t), that is defined for all time t contained in some interval on the real line.
- Square wave:
  - A square wave is a non-sinusoidal periodic waveform in which the amplitude alternates at a steady frequency between fixed minimum and maximum values, with the same duration at minimum and maximum.
- Sawtooth wave:
  - The sawtooth wave is a kind of non-sinusoidal waveform. It is so named based on its resemblance to the teeth of a plain-toothed saw with a zero rake angle.

1. Construct a Continuous and Discrete sine & cosine wave having amplitude=5 unit, frequ-ency.=3Hz then plot the signal all in single screen.

```
clc
close all
clear all
A=5;
f=3;
t=0:0.01:1;
x=A*sin(2*pi*f*t);
y=A*cos(2*pi*f*t);
subplot(221);
plot(t,x);
xlabel('time');
ylabel('amplitude');
legend('sinewave');
title('Continuous Sine/ Sameep Dhakal/563');
subplot(222)
plot(t,y);
xlabel('time');
ylabel('amplitude');
legend('coswave');
title('Continuous Cos/ Sameep Dhakal/563');
subplot(223)
stem(t,x);
xlabel('time');
ylabel('amplitude');
legend('sinewave');
title('Discrete sine/ Sameep Dhakal/563');
subplot(224)
stem(t,y);
xlabel('time');
ylabel('amplitude');
legend('sinewave');
title('Discrete cos/ Sameep Dhakal/563');
grid on;
```

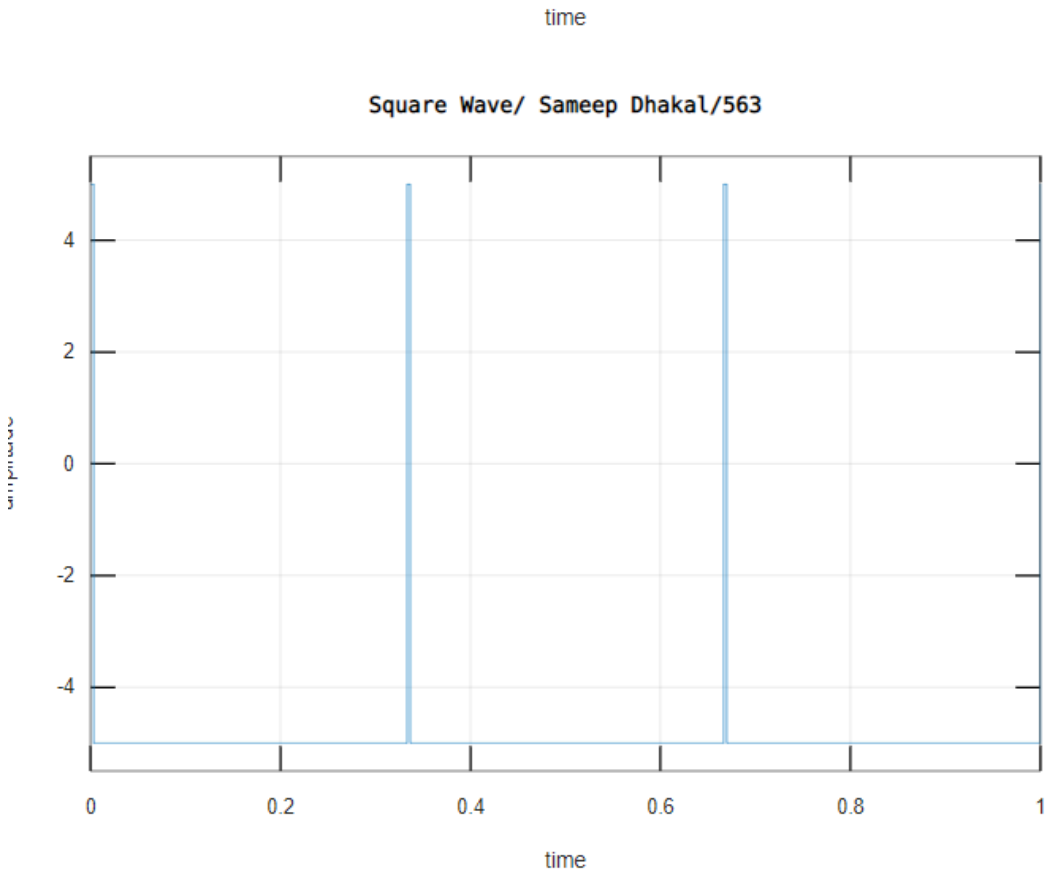
OUTPUT:



2. Construct a square wave having amplitude = 5unit, Frequency = 3Bz and duty cycle =1

```
clc
close all
clear all
A=5;
f=3;
t=0:0.0001:1;
x=A*square(2*pi*f*t*1);
plot(t,x);
axis([0 1 -5.5 5.5]);
xlabel('time') ;
ylabel('amplitude');
legend('SquareWave');
title('Square Wave/ Sameep Dhakal/563');
grid on;
```

OUTPUT:

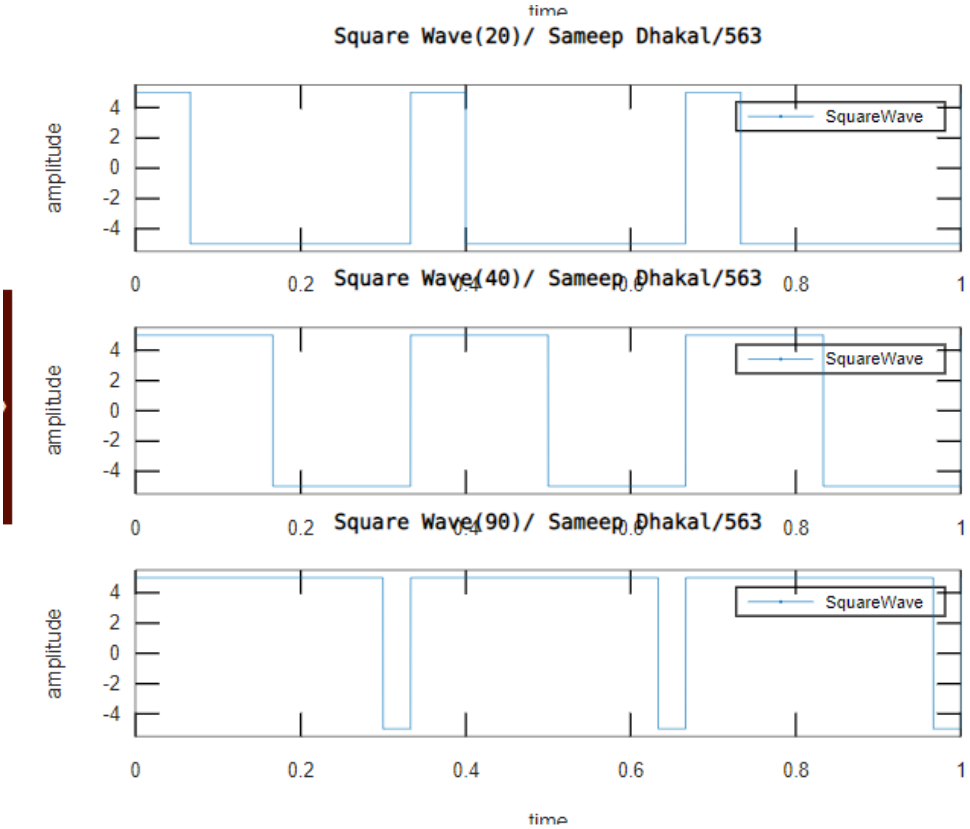


3. Construct a square wave having amplitude = 5unit, Frequency = 3Hz and duty cycle =20%, 50%, 90% all in one screen.

```
clc
close all
clear all
A=5;
f=3;
t=0:0.0001:1;
x=A*square(2*pi*f*t,20);
y=A*square(2*pi*f*t,50);
z=A*square(2*pi*f*t,90);
subplot(311);
plot(t,x);
axis([0 1 -5.5 5.5]);
xlabel('time') ;
ylabel('amplitude');
legend('SquareWave');
title('Square Wave(20)/ Sameep Dhakal/563');
subplot(312);
plot(t,y);
axis([0 1 -5.5 5.5]);
```

```
xlabel('time') ;
ylabel('amplitude');
legend('SquareWave');
title('Square Wave(40)/ Sameep Dhakal/563');
subplot(313);
plot(t,z);
axis([0 1 -5.5 5.5]);
xlabel('time') ;
ylabel('amplitude');
legend('SquareWave');
title('Square Wave(90)/ Sameep Dhakal/563');
grid on;
```

OUTPUT:

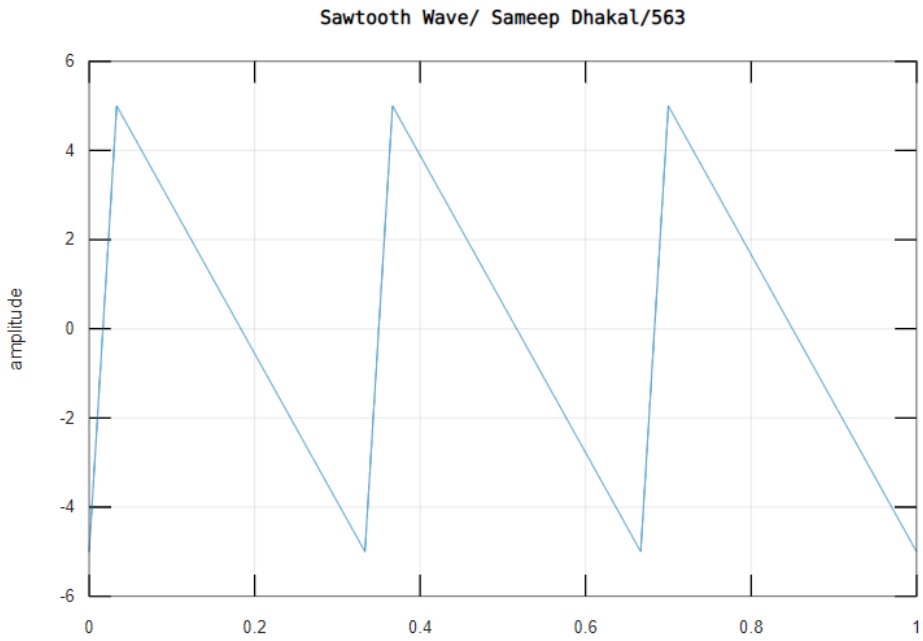


4. Construct a saw-tooth wave having amplitude = 5unit, Frequency = 3Hz and .width = 0.1

```
clc;
close all;
clear all; a=5;
f=3; t=0:0.0001:1;
 x= a*sawtooth(2*pi*f*t,0.1);
plot(t,x);
xlabel('time');
ylabel('amplitude');
legend('Sawtooth');
```

```
title('Sawtooth Wave/ Sameep Dhakal/563');
grid on;
```

OUTPUT:

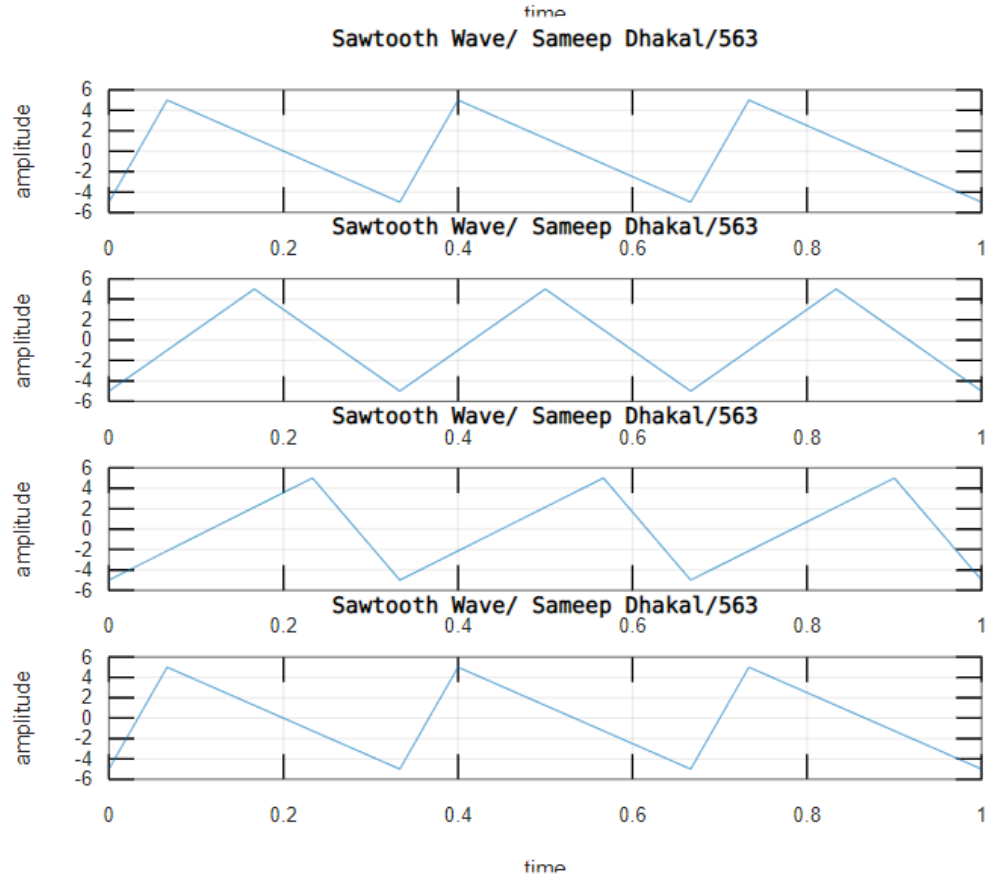


5. Construct a sawtooth wave having amplitude = 5unit, Frequency = 3Hz and duty width =0.2, 0.5, 0.7, 0.9 in one screen.

```
clc;
close all;
clear all;
a=5; f=3;
t=0:0.0001:1;
x=  a*sawtooth(2*pi*f*t,0.2);
subplot(411);
plot(t,x);
xlabel('time');
ylabel('amplitude');
title('Sawtooth Wave/ Sameep Dhakal/563');
grid on;
y=  a*sawtooth(2*pi*f*t,0.5);
subplot(412);
plot(t,y);
xlabel('time');
ylabel('amplitude');
title('Sawtooth Wave/ Sameep Dhakal/563');
grid on;
z=  a*sawtooth(2*pi*f*t,0.7);
```

```
subplot(413);
plot(t,z);
xlabel('time');
ylabel('amplitude');
title('Sawtooth Wave/ Sameep Dhakal/563');
grid on;
r=  a*sawtooth(2*pi*f*t,0.9);
subplot(414);
plot(t,x);
xlabel('time');
ylabel('amplitude');
title('Sawtooth Wave/ Sameep Dhakal/563');
grid on;
```

OUTPUT:



Discussion And Conclusion :

In this lab we plotted different types of waves and learn to use subplot in graph. We constructed waves with different duty cycles.