

# Course Name: Analog Communication

## MATLAB Experiment-3

**Objective** – Write MATLAB code to study *exponential Fourier series* representation of a *saw tooth wave* with fundamental period 2 and amplitude changes -1 to 1 during the period. Plot the Fourier series representation for  $n = 1, 10, 20$  and 50 and comment on the plots by comparing with the original function. Also, find difference with original function and explain Gibbs Phenomena.

### MATLAB Code:

```
syms t n
w0=pi;
t0=2; % fundamental timeperiod = 2
n=1:100;
t1=0:.01:10;

a0=(1/t0)*int((t-1),t,-1,1);
an=(2/t0)*int((t-1)*(exp(-sqrt(-1)*n*w0*t)),t,0,2);
% int stands for integration
%here a0,an are fourier coefficients

y = sawtooth(pi*t1); %sawtooth wave

m=1;
for r=[1 10 20 50]
    sum=0;
    for j=1:1:r
        sum=sum+(an(j))*exp(sqrt(-1)*w0*n(j)*t1);
    end
    subplot(2,4,m);
    m=m+1;
    plot(t1,sum,t1,y);
    xlabel('time');
    ylabel('Sum');
    legend('Fourier Series', 'Sawtooth Wave');
    subplot(2,4,m);
    m=m+1;
    plot(t1,sum-y);
    xlabel('time');
    ylabel('Difference');
    legend('Gibbs Phenomena');
end
```

## Results: Result obtain by the code

