- ECE 265 -

ANALYTIC TECHNIQUES IN ELECTRONIC AND COMMUNICATION ENGINEERING

LAB #10: FOURIER SERIES

Fourier series are infinite series designed to represent general periodic functions in terms of simple cosines and sines.

Assume f(x) is a function of x and periodic with 2π means f(x+2π)=f(x).

It can be represented that

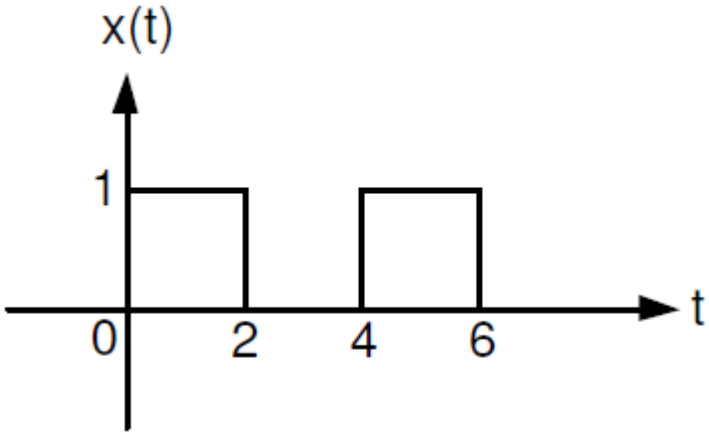
$f(x)=a_0+\sum_{n=1}^{\infty}(a_n\cos(n\pi x)+b_n\sin(n\pi x))$

Ex:find Fourier series coefficients of

$$f(x)=\begin{cases}-k & if \quad -\pi<x<0\\ k & if \quad 0<x<\pi\end{cases} and\ f(x+2\pi)=f(x)$$

and plot it on matlab for N=5,6,7,8,9,10.

Ex: For the given signal bellow directly find Fourier series represantation and plot on matlab.



$$x(t) = \sum_{k=-\infty}^{k=+\infty} X[k] e^{jkw_0 t} \qquad X[k] = \frac{1}{T} \int_T x(t) e^{-jkw_0 t} dt$$

$$x_N(t) = \sum_{k=-N}^{k=+N} X[k] e^{jkw_0 t} \qquad w_0 = \frac{2\pi}{T}$$

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t = -5 : 0.01 : 5;
xt = zeros(1, length(t));
N = 10;
for  k = -N : N
xk = 0.25*(1-exp(-j*k*pi))/(j*(k+0.001)*pi/2);
xt = xt + xk * exp(k * j * 0.5 * pi * t);
end
xt = 0.5 + xt;
plot(t, xt)
```