Problem 4

Code:

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% CENG 5131

% HW 7

% Problem 4

% Description:

% Using Matlab to plot the Fourier amplitude spectrum

% of a pulse train. This script also plots the

% fourier series representaton of the pulse train.

% Fourier series representation for the pulse train

A = 4;

w0 = (8e6)\*2\*pi;

tau = 0.05e-6;

n=1:100; % Number of components

Wn=zeros(size(n));

Wn=(A/pi)\*(sin(n\*w0\*(tau/2))./n); % Frequency spectrum n=1,2,...

Wn=[A\*tau\*w0/(2\*pi),Wn]; % Add dc term

n=[0,n];

%

t=[-10\*(1/w0):(1/(1000\*w0)):10\*(1/w0)]; % Range of t

f=zeros(size(t));

for k=1:1:100; % f(t) with 100 terms

f=f+(2\*A/(k\*pi))\*sin(k\*w0\*(tau/2))\*cos(k\*w0\*t); % in series

end

f=(A\*tau\*w0/(2\*pi))+f; % Add dc value A\*tau/T

% Put in a zero line and plot frequency

fzero=zeros(size(n));

clf % Clear any figures

subplot(2,1,1),plot(n,Wn,'\*',n,fzero,'-');

xlabel('w radians per second')

ylabel('(A/pi)\*sin(n\*w0\*tau/2)/n')

title('Fourier Series of Pulse Train')

% Plot f(t)

subplot(2,1,2),plot(t,f)

xlabel('t time in seconds')

ylabel('f(t)')

Plot:

