UNIVERSITY OF TEXAS AT DALLAS
Telecommunications Engineering

TE3302 Signals & Systems
Problem Set #3: Period of a signal and Unit Impulse and Unit Step Functions

Date assigned: September 13, 2000
Date due: September 20, 2000

Homework is due at the beginning of class. Late homework will not be accepted.

Reading: Signals & Systems, Sections 2.0 and 2.1

You may use any computer program to help you solve these problems, check answers, etc.

Problem 3.1 Period of a signal
Problem 1.11 in Signals & Systems

Problem 3.2 Unit Impulse and Unit Step Functions
Problem 1.12 in Signals & Systems

Problem 3.3 Unit Step Function
Problem 1.38 (a) in Signals & Systems

Problem 3.3 Using Matlab to find solution to the differential equations
The differential equation governing the behavior of the LRC circuit given in the class for the zero input is

\[ \frac{L}{d^2i(t)} + \frac{R}{dt} + \frac{i(t)}{C} = 0 \]  \hspace{1cm} (1)

If the circuit parameters are \( L = 1, R = 2 \), and \( C = 1/50 \), use the following MATLAB script to plot the current \( i(t) \) in the circuit. Initial conditions are \( i(0) = 2 \) and \( \frac{di(0)}{dt} = 16.78 \).

L=1;
R=2;
C=1/50;
p = [L R 1/C] \% Representation of the characteristic polynomial.
lambda=roots(p);
a = [0 L ; -1/C -R]; \% Enter the characteristic eqn.
b = [0;0]; \% Enter input coefficients.
t = 0:.025:2;
[m,k]=size(t);
[n, nb]=size(b);
i0=[2;16.78]; \% initial conditions vector.
tt=0;
for j=1:k,

z=expm(a*tt); % Matrix exponential 
A=z(1:nb,:);
i(1,j)=A*i0;
tt=tt+.025; % Time variable increment.

end

i=i(1:nb,:);
plot(t,i), grid,
title('plot for the current i(t)')

Repeat the same with \( L = 1, R = 5, \) and \( C = 1/6. \) Please turn in the hardcopy of both plots.