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

$$L\frac{d^2i(t)}{dt^2} + R\frac{di(t)}{dt} + \frac{i(t)}{C} = 0 \tag{1}$$

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.