

UNIVERSITY OF TEXAS AT DALLAS
Telecommunications Engineering

TE3302 Signals & Systems
Problem Set #9: Fourier Series

Date assigned: November 1, 2000

Date due: November 8, 2000

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

Reading: *Signals & Systems*, Sections 3.3, 3.4, and 3.5

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

Problem 9.1 Fourier Series

Problem 3.4 in *Signals & Systems*.

Problem 9.2 Fourier Series

Problem 3.5 in *Signals & Systems*.

Problem 9.3 Fourier Series

Problem 3.22 (d) in *Signals & Systems*.

Problem 9.4 You need to compute the truncated exponential Fourier series for the periodic square wave (or pulse train) in Example 3.5 of *Signals & Systems*. T and T_1 are selected as 1 and 0.5, respectively. The MATLAB commands are

```
t = -3:6/1000:3;
N = input('Number of harmonics=');
a0 = 0.5; % dc component coefficient
w0=pi;
xN=a0*ones(1,length(t)); % dc component

for k=1:N,
    ak=1/k/pi*sin(k*pi/2);
    a_k=ak; % it is a even real signal
    xN = xN + ak*exp(j*k*w0*t)+a_k*exp(-j*k*w0*t);
end
plot(t,xN);xlabel('Time');grid
```

Plot the truncated exponential Fourier series for the periodic square wave for $N = 3, 11, \text{ and } 45$. Turn in printout of the plots.