8 March 2002 **Name:**_____

EE 438 **Exam No. 2** **Spring 2002**

- You have 50 minutes to work the following four problems.
- Be sure to show all your work to obtain full credit.
- The exam is closed book and closed notes.
- Calculators are permitted.

1. (25 pts.) Consider the Z transform

$$X(z)=\frac{3}{(1+z^{-1})(1-\frac{1}{2}z^{-1})},\ \frac{1}{2}<|z|<1.$$

Find the signal $x[n]$ corresponding to this Z transform.

2. (25 pts) For each case below, answer the following questions:

   i. Find the values of k where peaks in the N point DFT of the signal $x[n]$ occur.
   ii. Are leakage and picket fence effects present?
   iii. Sketch the magnitude $X_N[k]$ of the N point DFT of the signal $x[n]$.

   a. $x[n] = \cos(\pi n / 4),\ N = 24$
   b. $x[n] = \cos(\pi n / 3),\ N = 21$
   c. $x[n] = \cos(\pi n / 3),\ N = 63$

3 (25 pts.)

a. Find an expression for a 6 point decimation-in-time Fast Fourier Transform algorithm.

b. Draw a complete block diagram for your algorithm. Be sure to show every twiddle factor in order to obtain full credit.

4. (25 pts.) Compute a 6 point circular convolution of the two signals shown below:

n	0	1	2	3	4	5
$x[n]$	1	2	3	0	0	−1
$y[n]$	1	1	1	−1	−1	−1