CALIFORNIA STATE UNIVERSITY, FULLERTON
DEPARTMENT OF ELECTRICAL ENGINEERING

EG-EE 420 Test #2 Spring 2010

(25) 1. The input/output relation of a **stable** LSI system is given by:

$$y(n-1) - \frac{10}{3}y(n) + y(n+1) = x(n)$$

(8) a) Find the system function, $H(z)=Y(z)/X(z)$, as ratio of two polynomials in positive powers of z

(7) b) Show the pole/zero plot of the above system and shade the region of convergence

(10) c) Find the unit-sample response of this system

$= \frac{10}{6} \pm \frac{1}{2}$

$= \frac{5}{3} \pm \frac{1}{2}$

$= \frac{5}{3} \pm \frac{1}{2}$

$= \frac{5}{3} + \frac{1}{2}$

(25) 2. Let x(n)={2, -1, 0, 2} and y(n)={1, 1, -1} (**Note**: the first number represents the function at n=0, the second number is the function at n=1, and so on)

(15) a) Find 4-point circular convolution of x(n) and y(n) (**directly**) using

$$c(n) = x(n) \otimes y(n) = \left[\sum_{m=0}^{N-1} x(m) y((n-m))_N\right] R_N(n)$$

(10) b) Find the linear convolution of x(n) and y(n) and use it to verify the results obtained in part (a). Note: $x(n) * y(n) = \sum_{k=-\infty}^{\infty} x(k)\, y(n-k)$

(30) 3. Compute the N-point DFT of the following sequences using:

$$X(k) = \sum_{n=0}^{N-1} x(n) e^{-j2\pi nk/N} \qquad k = 0,1,\ldots,N-1$$

(10) a) $x(n)=\delta(n-n_0)$ $\quad n=0, \bullet\bullet\bullet, N-1 \quad 0 \le n_0 < N$

(10) b) $x(n) = a^n$ $\quad n=0, \bullet\bullet\bullet, N-1$

(10) c) In part (b), find $|X(k)|$ corresponding to frequency of 5 Hz if N=32, sampling frequency $f_s$=40Hz, and a=0.8.

0 1 2 3

(20) 4.

(10) a) A finite length sequence x(n) is given to be {3, 2, 0, 2} (i.e., x(0)=3, x(1)=2,...) Plot $x((2-n))_6$.

assume

(10) b) The transfer function $H(z) = \dfrac{3+7z^{-1}+6z^{-2}+6z^{-3}-3z^{-5}}{1+2z^{-1}+z^{-2}-z^{-4}}$ can be written as $H(z) = f(z^{-1}) + \dfrac{a+2z^{-1}}{1+z^{-1}-z^{-2}} + \dfrac{b-z^{-1}}{1+z^{-1}+z^{-2}}$

Find $f(z^{-1})$, 'a' and 'b'

$(a+2z^{-1})(1+z^{-1}+z^{-2}) + (b-z^{-1})$