DSP ASSIGNMENT -1

Ques. 1.Given $x(n)=2^n$ and N=8, find X(k) using DIT-FFT algorithm.

Ques 2Find the IDFT of the sequence

X(k)={1, 1+j, 2, 1-2j, 0, 1+2j, 0, 1-j}

Ques 3 Compute the DFT of the sequence whose values for one period is given by {1,1,-2,-2}

Ques 4.A finite duration sequence of length L is given as x(n)={1, 0<=n<=L-1

and 0 otherwise}

Determine the N-point DFT of this sequence for N>L.

Ques 5. Find the IDFT of Y(k) = {1,0,1,0}.

DSP ASSIGNMENT -2

(IIR FILTER)

Q1: A first order Butterworth low pass transfer function with a 3dB cutofffrequency at Ωc is given by

$$H(s)=\frac{\Omega c}{s+\Omega c}$$

Design a single pole low pass with 3db BW of 0.2 π using Bilinear Transformation.

Q2:Determine the lowest order of a lowpass Chebyshev Filter having equiripple lowpass characteristics with 1dB cutoff frequency at 1kHz and minimum attenuation of 40dB at 5kHz.

Q3: Convert analog filter

$$H(s)=\frac{2}{(s+1)(s+2)}$$

into digital filter by mean of Bilinear transformation method.

Q4:Find the relation between Ω and ω using Impulse invariance method.

DSP ASSIGNMENT -3

1. Given the specifications of a Butterworth filter
   $\alpha_p = 1$ dB; $\alpha_s = 30$ dB, $\Omega_p = 200$ rad/sec; $\Omega_s = 600$ rad/sec. Determine the order of the filter.
2. Obtain an analog Chebyshev filter transfer function that satisfies the constraints:

$$\frac{1}{\sqrt{2}} \le |H(j\Omega)| \le 1 \qquad 0 \le \Omega \le 2$$

$$|H(j\Omega)| \le 0.1 \qquad \Omega \ge 4$$

3. Realize the second order system
   $y(n) = 2rcos(\omega_0)y(n-1) - r^2y(n-2) + x(n) - rcos(\omega_0)x(n-1)$
   in Direct form-II.
4. Realize the system with difference equation
   $y(n) = \frac{3}{4}y(n-1) - \frac{1}{8}y(n-2) + x(n) + \frac{1}{3}x(n-1)$ in cascade form.
5. Realize the system given by difference equation
   $y(n) = -0.1y(n-1) + 0.72y(n-2) + 0.7x(n) - 0.252x(n-2)$ in parallel form.
6. Obtain the Direct form-I, Direct form-II, cascade and parallel form realization for the following system:
   $y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2)$.
7. Realize the following FIR filter function using minimum no. of multipliers:
   $H(z) = 1 + \frac{1}{3}z^{-1} + \frac{1}{4}z^{-2} + \frac{1}{4}z^{-3} + \frac{1}{3}z^{-4} + z^{-5}$.
8. Differentiate between FIR and IIR filters.
9. Develop a canonic form realization of the transfer function
   $H(z) = \dfrac{3 + 5z^{-1} - 8z^{-2} + 4z^{-5}}{2 + 3z^{-1} + 6z^{-3}}$
   and then determine its transpose configuration.
10. Develop the cascade and parallel forms of the following IIR transfer function:
   $H(z) = \dfrac{2 + 5z^{-1} + 12z^{-2}}{\left(1 + \frac{1}{2}z^{-1} - \frac{1}{4}z^{-2}\right)\left(1 + \frac{1}{4}z^{-1} + \frac{1}{8}z^{-2}\right)}$

DSP ASSIGNMENT -4

1. Develop the lattice ladder structure for the filter with difference equation $y(n) + \frac{3}{4}y(n-1) + \frac{1}{4}y(n-2) = x(n) + 2x(n-1)$ July 2013

2. For $y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2)$ obtain direct form I and direct form II with single pole zero subsystem

3. Obtain direct form I and direct form II canonic and cascade realization of

$$H(z) = \frac{(z-1)(z^2+5z+6)(z-3)}{(z^2+6z+5)(z^2-6z+8)}$$

   the cascade system should consist of two biquadratic sections.

4. Given $H(z) = (1 + 0.6z^{-1})$

   (i) Realize in direct form

   (ii) Realize as a cascade of first order sections only

   (ii) As a cascade of first and 2nd order sections DEC 2012

5. Determine direct form I and direct form II for the second order filter given by

$$y(n) = 2b\ cos\ w_0 y(n-1) - b^2 0.2y(n-2) + x(n) - b\ cos\ w_0 x(n-1)$$

6. Given the system function:

$$H(z) = \frac{2+8z^{-1}+6z^{-2}}{1+8z^{-1}+12z^{-2}}$$

   realize using lader structure

7. Obtain cascade ladder structure of the the system function: canonic and cascade realization of

$$H(z) = [1 + \frac{1}{2}z^{-1} + z^{-2}][1 + \frac{1}{4}z^{-1} + z^{-2}]$$

DSP ASSIGNMENT -5

1. Obtain the decimated signal w(n) by a factor 3 from the input signal x(n)= {0,5,4,3,1,2,5,0,5,4,3,1,2,5,0,…..}. Obtain output y(n) by interpolating the signal by a factor 3.
2. Consider a sample sequence x(n)={0,3,6,9,12}. Using linear interpolation method increase the sampling rate for L=2.
3. if x(n)={1,3,7} to be interpolated by a factor 3,then interpolated sequence is given by
    a) x(n)= {1,5,7,3,4,8,7,8}
    b) x(n)={1,0,0,3,0,0,7}
    c) x(n)={1,0,0,0,3,0,0,0}
    d) x(n)={0,1,0,3,0,7,0}
4. Show that up sampler and down sampler are time-variant systems.
5. Design a sample rate converter that increases the sampling rate by a factor of 2.5. Use the Remez algorithm to determine the coefficients of the FIR filter that has a 0.1dB ripple in the pass band and is down by at least 30 dB in the stop band. Specify the sets of time-varying coefficients g(n,m) used in the realization of the sampling rate converter.
6. if x(n)= {1,5,7,3,4,8,7,8} to be decimated by a factor 3, then decimated sequence is given by
    a) x(n)= {1,3,7}
    b) x(n)={1,4,0}
    c) x(n)={1,4}
    d) x(n)={7,8,0}