Code No: EC502 **OR**

III B.Tech.(CCC) Supplimentary Examinations, June 2008
DIGITAL SIGNAL PROCESSING
(Electronics & Communication Engineering)

Time: 3 hours **Max Marks: 100**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Consider a discrete linear time invariant system described by the difference equation:
Y(n)-(3/4)y(n-1)+(1/8)y(n-2)=x(n))+(1/3)x(n-1)
Where y(n) is the output and x(n) is the input.
Assuming that the system is relaxed initially obtain the unit sample response of the system.

   (b) Find the:

      i. impulse response

      ii. output response for a step input applied at n=0 of a discrete time linear time invariant system whose difference equation is given by y(n) = y(n-1)+0.5 y(n-2)+x(n)+x(n-1). [10+10]

2. (a) An LTI system is described by the equation y(n)=x(n)+0.81x(n-1)-0.81x(n-2)-0.45y(n-2). Determine the transfer function of the system. Sketch the poles and zeroes on the Z-plane.

   (b) Define stable and unstable system test the condition for stability of the first-order IIR filter governed by the equation y(n)=x(n)+bx(n-1). [10+10]

3. Prove the following properties of the discrete Fourier series for periodic sequences.

Sequences	Discrete Fourier Series
(a) x(n+m)	$W_N^{-Km}X(K)$
(b) x*(n)	X*(-K)
(c) x*(-n)	X*(K)
(d) Re[x(n)]	$X_e(K)$
(e) jlm[x(n)]	$X_o(K)$

[20]

4. (a) Distinguish between DFT and DTFT .

   (b) Consider a sequence x(n) of length L. Consider its DTFT $X_d(w)$ is sampled and N is the number of frequency samples. Discuss the relation between L and N for inverse DTFT = inverse DFT comment on the aliasing problem.

   (c) Compute the DFT of $x(n) = \{1, 0, 0, 0\}$ and compare with $X_d(w)$. [6+7+7]

5. (a) Implement the decimation in time FFT algorithm for N=16.

   (b) In the above Question how many non - trivial multiplications are required. [12+8]

6. Determine the system function H(Z) of the lowest order Chebyshev digital filter that meets the following specifications.
   (a) 1 db ripple in the passband $0 \leq |W| \leq 0.3\pi$
   (b) At least 60 db attenuation in the stopband $0.35\pi \leq |W| \leq \pi$. Use the bilinear transformation. [20]

7. (a) Describe the principle of designing FIR filter using DFT method.
   (b) Using frequency sampling method, design a band pass filter with the following specifications.
   Sampling frequency F =8000Hz
   Cut-off frequency $f_{c1} = 1000Hz$ $f_{c2} = 3000Hz$
   Determine the filter coefficients for N=7. [8+12]

8. (a) Explain the different structures for realisation of IIR system. and explain how conversion can be made from direct form I structure to direct form II structure.
   (b) Realize the given system in cascade and parallel form
   $H(Z) = \frac{1+\frac{1}{2}Z^{-1}}{\left[1-Z^{-1}+\frac{1}{4}Z^{-2}\right]\left[1-Z^{-1}+\frac{1}{2}Z^{-2}\right]}$ [10+10]

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