Code :RR311102 **RR**

III B.Tech I Semester(RR) Supplementary Examinations, May 2011
DIGITAL SIGNAL PROCESSING
(Electronics & Computer Engineering, Biomedical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Define a discrete linear time invariant system and give an example. What are causality and stability?
   (b) 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.

2. (a) An LTI system has unit sample response
   h(n) = u(n)-u(n-N)
   Find the amplitude and phase spectra
   (b) If x(n) and $X(e^{jw})$ represent any general sequence and its transform. Determine the transform of the following sequence in terms of $X(e^{jw})$.
   $g(n) = \begin{cases} x(n/2) & n\,even \\ 0 & n\,odd \end{cases}$

3. (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 $X_d(w)$.

4. An 8 point sequence is given by x(n) = {2,2,2,2,1,1,1,1}. Compute 8 point DFT of x(n) by
   (a) radix - 2 D I T F F T
   (b) radix - 2 D I F FF T
   Also sketch magnitude and phase spectrum.

5. (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).

6. (a) Explain the relation between analog and digital filters poles in IIM of transformation.
   (b) Discuss the Aliasing effect due to impulse invariance transformation (IIM)
   (c) Explain the method of determination of pole locations on an ellipse with major axis 'R' and minor axis 'r' for Chebyshev filter.

7. (a) Design a band stop filter to reject frequencies in the range 1-2 radians/second using rectangular window N=7
   (b) Write the magnitude and phase function of FIR filter when impulse response is anti symmetric and N is odd function.

8. (a) Explain the factors that influence the choice of structure for realisation of a LTI system.
   (b) An LTI system is described by the difference equation $y(n) = a_1 y(n-1) + x(n) + b_1 x(n-1)$
   Realize it in direct form I structure and convert it to direct form II structure.

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