Code :RR320403 **RR**

III B.Tech II Semester(RR) Supplementary Examinations, April/May 2011
DIGITAL SIGNAL PROCESSING
(Electronics & Communication Engineering, Electronics & Instrumentation Engineering, Electronics & Control Engineering, Instrumentation & Control Engineering)

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

Answer any FIVE questions
All questions carry equal marks

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1. (a) Prove the statement that a linear time invariant discrete system is stable if and only if $\sum_{n=-\infty}^{\infty} |h(n)| < \infty$ where h(n) is the unit sample response of the system.
   (b) Let e(n) be an exponential sequence $e(n) = \alpha^n$ for all 'n' and let x(n) and y(n) be two arbitrary sequences. Show that [e(n)y(n)]* [e(n)x(n)]=e(n)[y(n)*x(n)]where ?*? denotes convolution operation.

2. (a) Discuss the frequency-domain representation of discrete-time systems and signals. By deriving the necessary relation.
   (b) Draw the frequency response of LSI system with impulse response $h(n) = a^n u(-n)$ $(|a| < 1)$

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. (a) Give the steps involved in implementing Radix -2, DIT FFT algorithm.
   (b) Compute the 16-point DFT of $x(n) = Cos\frac{\pi}{2}n$ $0 \leq n \leq 15$ using Radix - 2 , DIT algorithm.

5. (a) An LSI system is characterized by: $y(n) = \frac{5}{6}y(n-1) - \frac{1}{6}y(n-2) + x(n)$. Find the system function and determine its response to the input signal $x(n) = \delta(n) - \frac{1}{3}\delta(n-1)$.
   (b) Write about Jury's criterion.

6. Use the Bilinear transformation to convert the analog filter with system function $H(S) = S + 0.1/(S + 0.1)^2 + 9$ into a digital IIR filters. Select T = 0.1 and compare the location of the zeros in H(Z) with the locations of the zeros obtained by applying the impulse invariance method in the conversion of H(S).

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) Realize an FIR filter with impulse response h(n) given by $h(n) = \left(\frac{1}{2}\right)^n [u(n) - u(n-5)]$
   (b) A system is described by it's transfer function H(Z) given by $H(Z) = 4 + \frac{3Z}{Z-\frac{1}{2}} - \frac{1}{Z-\frac{1}{4}}]$

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