

**Code No: C9301****JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M.Tech I - Semester Examinations, March/April 2011****ADVANCED DIGITAL SIGNAL PROCESSING****(SYSTEMS AND SIGNAL PROCESSING)****Time: 3hours****Max. Marks: 60****Answer any five questions****All questions carry equal marks**

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1. Compare the following:
  - a) Butterworth and Chebyshev Approximations
  - b) FIR and IIR Filter designs. [12]
  
- 2.a) Define sampling rate conversion. Explain the Process of Interpolation by a factor I.
  - b) The bandwidth of a sequence  $x(n)$  is 3.4 KHz and its sampling rate is to be reduced, by decimation from 240 KHz to 8KHz. Assume that an Optimal FIR filter is to be used, with an overall pass-band ripple 0.05 and stop-band ripple 0.01. Design an efficient Two Stage Decimator. [12]
  
- 3.a) Discuss in brief about Welch method of Power Spectrum Estimation.
  - b) Determine the frequency resolution of Bartlett, Welch, and Blackman-Tukey methods of power spectrum estimates for a quality factor  $Q = 10$ . Assume that overlap in Welch method is 50% and length of sample sequence is 1000. [12]
  
- 4.a) Derive the relation between Auto-Correlation and Model Parameters of ARMA and from that derive for AR and MA models.
  - b) Discuss in brief about Burg Method and List out the Advantages and Disadvantages of it. [12]
  
- 5.a) Discuss the effect of ADC Quantization noise on Signal Quality.
  - b) What are Limit Cycles and discuss various types of Limit Cycles in brief.
  - c) Discuss in brief about Co-efficient word length requirements for stability and desired frequency response. [12]
  
- 6.a) Compare and Contrast Non-Parametric and parametric methods of power spectral density.
  - b) Addition over flow errors and their remedies. [12]
  
7. Discuss how to solve normal equations using schur algorithm and also show that it requires computations of order  $O(p)$  compared to Levinson algorithm which requires computations of order  $O(p^2)$ . [12]
  
- 8.a) What is the use of DFT in power spectrum estimation
  - b) Define Periodo-gram and prove that it is a poor estimate of power spectrum estimation.
  - c) Compute the auto correlation and power spectral density for the signal  $x(t) = k \cos(2\pi f_c t + \phi)$ .  
Where  $K$  and  $f_c$  are constants and  $\phi$  is a random variable, which is uniformly, distribute over the interval  $(-\pi, \pi)$ . [12]