

**Code No: C6103, C6503****JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M.Tech I - Semester Examinations, March/April 2011****ADVANCED DIGITAL SIGNAL PROCESSING****(COMMON TO COMMUNICATION SYSTEMS, WIRELESS AND MOBILE COMMUNICATIONS)****Time: 3hours****Max. Marks: 60****Answer any five questions  
All questions carry equal marks**

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- 1.a) Find  $X(K)$  for the given sequence  $x(n) = \{1,2,3,4,4,3,2,1\}$  using DIT-FFT Algorithm.
- b) Compare the computational complexity of DFT and FFT. [12]
- 2.a) What is Multi-rate Digital Signal Processing? List out the advantages of it.
- b) The sampling rate of a signal  $x(n)$  is to be reduced by decimation from 96 KHz to 1KHz. The highest frequency of interest after decimation is 450 Hz. Assume that an optimal FIR filter is to be used with an overall pass-band ripple  $\delta_p = 0.01$  and  $\delta_s = 0.001$ . Design an efficient three stage decimator with factors  $(12 \times 4 \times 2)$ . [12]
- 3.a) Define Linear Prediction and bring out the relationship between forward and backward linear prediction coefficients.
- b) Prove that a forward prediction error filter is minimum phase and backward prediction filter has maximum phase. [12]
- 4.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]
- 5.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 Yule-Walker Method of power spectrum estimate and compare it with the Burg method. [12]
- 6.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? [12]
- 7.a) Compare and Contrast Non-Parametric and parametric methods of power spectral density.
- b) Discuss how to design Poly-phase Filter structure for Interpolators and how it is advantageous w.r.t direct form structures. [12]
8. Discuss how to solve normal equations using Levinson Durbin Algorithm. [12]