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12EC123

**M.Tech Degree Examination, Dec.2015/Jan.2016**  
**Modern DSP**

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions.**

1. a. Consider the analog signal  $x(t) = 5 \cos 100\pi t$ , what is the discrete signal obtained if  $x(t)$  is sampled at 75Hz and what is the analog signal obtained from the discrete signal of previous case? (06 Marks)  
 b. Classify and discuss with practical examples of signals. (06 Marks)  
 c. Explain the steps involved in ADC of a signal in detail. (08 Marks)
2. a. Perform circular convolution of sequences.  
 $x_1(n) = \{2, 1, 2, 1\}$ ,  $x_2(n) = \{1, 2, 3, 4\}$  using DFT and IDFT. (10 Marks)  
 b. State and prove multiplication property of DFT's. (06 Marks)  
 c. Compare linear and circular convolution with examples. (04 Marks)
3. a. Compare in detail, the fast convolution methods. (10 Marks)  
 b. State and prove Time reversal and Time shift properties of DFT. (10 Marks)
4. a. Design a digital low pass Chebyshev filter with an attenuation of -1dB at pass band cut off frequency of  $0.15\pi$  and -20dB at  $0.45\pi$  using the sampling frequency of 2000 samples/sec. Use BLT. (10 Marks)  
 b. Convert  $H(s) = \frac{0.5(s+4)}{(s+1)(s+2)}$  to  $H(z)$  using Impulse invariant transformation. (05 Marks)  
 c. Discuss the different windows used to design FIR filters. (05 Marks)
5. a. An analog signal contains frequencies upto 10KHz, the same signal sampled at 50KHz. Design an FIR filter having linear phase characteristic and transition band of 5KHz. The filter should provide minimum 50dB attenuation at the end of transition band. Use hamming window. (12 Marks)  
 b. Compare the design procedure of Frequency sampling method and Equiripple method. (08 Marks)
6. a. Explain with equations the Interpolation and Decimation in detail. (10 Marks)  
 b. Discuss the multi stage implementation sampling rate conversion with an example. (10 Marks)
7. a. Illustrate the sampling rate conversion for a rational ratio  $I/D = 5/3$  using polyphase structures. (08 Marks)  
 b. List the applications of multirate signal processing and explain any two in detail. (12 Marks)
8. a. With neat diagram, explain two channel QME banks in sub band coding. (08 Marks)  
 b. Discuss any two applications of adaptive filters in detail. (06 Marks)  
 c. Compare LMS and RLS algorithms. (06 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8=50, will be treated as malpractice.