

**FACULTY OF INFORMATICS****B.E. 3/4 (IT) I – Semester (Main) Examination, November 2013****Subject : Digital Signal Processing****Time : 3 hours****Max. Marks : 75****Note: Answer all questions from Part-A and any FIVE questions from Part-B.****PART – A (25 Marks)**

1. Give the classification of discrete time signals. 3
  2. Find the factor of saving in number of complex multiplications, using radix-2 DFT over direct DFT when the length of the sequence  $N = 32$  and  $N = 64$ . 2
  3. Define phase delay and group delay associated with linear phase FIR filters. 2
  4. Draw the linear phase realization of the FIR system represented by the transfer functions as follows. 3
- $$H(z) = 0.2 + 0.4z^{-1} + 0.6z^{-2} + 0.4z^{-3} + 0.2z^{-4}$$
5. Explain why a stable IIR filter can not have linear phase. 2
  6. Using impulse invariant transformation, find  $H(z)$  when  $H(s) = \frac{1}{s^2 + 2s + 10}$ . 3

Sampling period  $T = 0.5$  S

7. Write the differences between IIR and FIR filters. 3
8. Explain about MAC unit used in programmable DSPs. 2
9. Write the applications of programmable DSP devices. 3
10. Explain about DSP-based biometry receiver system. 2

**PART – B (50 Marks)**

- 11.a) State and prove symmetry properties of DFT. 3
- b) Compute the 8-point DFT of the sequence  $x(n) = \{1, 2, 1, 2, 1, 3, 1, 3\}$  using radix-2 DIT FFT. 7
- 12.a) Write the characteristic features of windows used in FIR filter design. 3
- b) Design an FIR filter of length 7 using Hamming window to meet the following specifications. 7

$$H_d(w) = e^{-j3w} \quad -\frac{\pi}{4} \leq w \leq \frac{\pi}{4}$$

$$= 0 \quad \frac{\pi}{4} \leq w \leq \pi$$

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- 13.a) Differentiate between Butterworth and Chebyshev approximation. 2  
 b) Design a Butterworth digital IIR high pass filter using bilinear transformation 8  
 by taking  $T = 1$  sec to satisfy the following specifications.

$$0.8 \leq |H(e^{jw})| \leq 1.0 \quad \text{for } 0.7\pi \leq w \leq \pi$$

$$|H(e^{jw})| \leq 0.3 \quad \text{for } 0 \leq w \leq 0.4\pi$$

- 14.a) Draw the functional diagram of the central processing unit of TMS320C54XX processor and explain the same. 6  
 b) Distinguish between Harvard architecture and Von-Neumann architecture for processors. 4
15. Draw the block diagrams of JPEG encoder and decoder. Explain about encoding and decoding of JPEG using TMS320C54XX. 10
16. Find the linear convolution of the following sequences 10  
 $x(n) = \{1, -1, 2, 1, -1, 2, 1, -1, 2\}$  and  $h(n) = \{2, 3, -1\}$  using i) overlap add method  
 ii) overlap save method.
17. Obtain the direct form-I, direct form-II and cascade form realizations of the LTI system governed by the equation 10

$$y(n) = \frac{-3}{4}y(n-1) + \frac{1}{2}y(n-2) + \frac{1}{4}y(n-3) + x(n) + 4x(n-1) + 3x(n-2).$$

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