Code No. 6115

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

$H_d(w) = e^{-J3w}$ $\quad \frac{-\pi}{4} \le w \le \frac{\pi}{4}$

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

..2

13.a) Differentiate between Butterworth and Chebyshev approximation. 2

b) Design a Butterworth digital IIR high pass filter using bilinear transformation by taking T = 1 sec to satisfy the following specifications. 8

$$0.8 \le |H(e^{jw})| \le 1.0 \quad \text{for } 0.7\pi \le w \le \pi$$
$$|H(e^{jw})| \le 0.3 \quad \text{for } 0 \le w \le 0.4\pi$$

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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