29.4.19

Roll No. | | | | | | | | | |

B.E (Full Time) END SEMESTER EXAMINATIONS APRIL/MAY 2019

ELECTRONICS AND COMMUNICATION ENGINEERING
(Common to ECE & Biomedical Engineering)

Fifth Semester

EC 8551 DISCRETE TIME SIGNAL PROCESSING

(Regulation 2012)

Time: 3 Hours | Answer ALL Questions | Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. Define the condition for a system to be linear time invariant.
2. Write the DFT pair expression.
3. Define phase delay and group delay.
4. Write the tradeoff between FIR and IIR filter.
5. Can impulse invariant method be used to design a high pass filter?
6. What is warping effect?
7. How the floating point number is represented in DSPs? Give its standard format.
8. Define dead band in limit cycle oscillations.
9. What is the cause if antialiasing filter is not present in downsampling?
10. List the applications of multirate signal processing.

Part – B (5 x 16 = 80 marks)

11. (i). Explain limit cycle oscillations in recursive systems with an example. (6)

(ii). What is the power produced by the quantization noise at the output of the filter described by the difference equation y(n) = 0.999 y(n – 1) + x(n) if the input is quantized to 8 bits. (6)

(iii). Obtain the quantization error range due to rounding and truncation for fixed point representations. (4)

12. a) (i). Prove the property 'Multiplication of two DFTs result in circular convolution in time domain'. (10)

(ii). Find inverse DFT for the given X(k) = [2.5, -5 - j0.5, -0.5, -0.5 + j0.5] (6)

(OR)

b) Compute the 8-point DFT for the sequence x(n) = {0, 1, 2, 3, 4, 5, 6, 7} using DIT FFT algorithm.

13. a) (i). $H_a(s) = \frac{s+0.1}{(s+0.1)^2+9}$. Convert this analog filter into digital filter by impulse invariance method. (6)

(ii). Find the order of the Low Pass Chebyshev filter for the following specifications. $\Omega p = 1$, $\Omega s = 2.33$, $\alpha p = 0.5dB$, $\alpha s = 22dB$. (6)

(iii). Realize the following with Direct Form 1 realizations.
$y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2)$ (4)

(OR)

b) Determine H(z) for a Butterworth Filter satisfying the following constrains.

$$\sqrt{0.5} \leq |H(e^{j\omega})| \leq 1, \qquad 0 \leq \omega \leq \pi/2$$

$$|H(e^{j\omega})| \leq 0.2, \qquad \frac{3\pi}{2} \leq \omega \leq \pi$$

14. a) Design a band stop FIR filter which has the cut off frequency of 150Hz and 250 Hz. Assume sampling frequency of 1000Hz, filter length is 9 and use Hamming window. Realize the designed filter using linear phase structure.

(OR)

b) Explain frequency sampling method.

15. a) (i). Derive the input and output relation of interpolation process in time domain and frequency domain. Also discuss the significance of the anti-imaging filter. (10)

(ii). Under what condition a cascade of upsampler of factor I and downsampler of factor D is interchangeable. (6)

(OR)

b) (i). Explain subband coding with necessary block diagram. (8)

(ii).Explain poly phase structure for decimation process. (8)
