K 1119

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2004.

Fifth Semester

Electronics and Communication Engineering

EC 333 — DIGITAL SIGNAL PROCESSING

(Common to Bio–medical Engineering)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is BIBO stability?

2. How will you perform linear convolution using circular convolution?

3. State the properties of Butterworth filter.

4. What is frequency warping?

5. What are the advantages of FIR filters?

6. List the characteristics of FIR filters designed using window functions.

7. What is dead band?

8. How can overflow limit cycles be eliminated?

9. Define mean and variance of a random process.

10. What is meant by sub–band coding?

PART B — (5 × 16 = 80 marks)

11. (i) Derive the steady state noise power at the output of an LTI system due to the quantization at the input. (8)

    (ii) Explain about fixed point and floating point representations. (8)

12. (a) (i) Find the response of an LTI system with impulse response $h(n) = \{-4, -4, -6\}$ for input $x(n) = \{1, 2, 3, 4, 5\}$ using circular convolution. (8)

(ii) Determine whether the following input–output relation of an LTI system stable or not.

(1) $y(n) = \exp\{x(n)\}$

(2) $y(n) = x^2(n) + x(n + 1) - x(n + 2)$ (4 + 4)

Or

(b) (i) Derive decimation–in–frequency radix–2 FFT algorithm for evaluating N point DFT of the given discrete time sequence $x(n)$. (8)

(ii) Using FFT algorithm find the DFT of $x(n) = \{2, 2, 2, 2, 1, 1, 1, 1\}$. (8)

13. (a) (i) Derive the equation for calculating the order of the Butterworth filter. (6)

(ii) Using impulse invariant mapping technique, convert the following analog transfer function into digital. Assume $T = 0.1$ sec.

$$H(s) = \frac{2}{(s+1)(s+2)}$$ (10)

Or

(b) (i) Describe bilinear transformation mapping for designing IIR filter. (8)

(ii) Explain how will you develop cascade realizations from direct form realization. (8)

14. (a) Derive the frequency response of a linear phase FIR filter with symmetric impulse response.

Or

(b) (i) Explain the design procedure for designing FIR filter using window function. (8)

(ii) Explain the concept of optimum equiripple filter. (8)

15. (a) Explain sampling rate increase by an integer factor I and derive the input–output spectra relation.

Or

(b) (i) Explain periodogram method of estimating power spectrum. (8)

(ii) What is QMF filter? And explain. (8)

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