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Question Paper Code : P 1258

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2009.

Fifth Semester

(Regulation 2004)

Electronics and Communication Engineering

EC 1302 — DIGITAL SIGNAL PROCESSING

(Common to B.E. (Part–Time) Fourth Semester – E.C.E. – Regulation 2005)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. What is meant by radix 2 FFT algorithm.

2. What is the relationship between z transform and DFT?

3. What are the properties of FIR Filters?

4. State the limitations of Impulse Invariance mapping technique.

5. Define zero input limit cycle oscillation.

6. What is called dead band?

7. What is the need for spectrum estimation?

8. Define periodogram.

9. What is meant by pipelining?

10. What are the desirable features of DSP processors?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Describe the following properties of DFT.

(1) Convolution

(2) Time Reversal

(3) Time shift

(4) Periodicity. (12)

(ii) Compare the computational complexity of Direct DFT computation and FFT computation of a sequence with N = 64. (4)

Or

(b) (i) Explain Decimation in time FFT algorithm for N = 8. (8)

(ii) Determine the 4 point DFT of $x(n) = \{0, 1, 2, 3\}$. (8)

12. (a) (i) Describe the Frequency sampling method of designing FIR filters. (8)

(ii) Derive the condition for linear phase in FIR filters. (8)

Or

(b) (i) The desired response of a low pass filter is

$$H_d(e^{jw}) = e^{-j3w} \quad -\frac{3\pi}{4} \le w \le \frac{3\pi}{4}$$

$$= 0 \qquad \frac{3\pi}{4} \le |w| \le \pi$$

Design the filter for M = 7 using Hamming Window. (10)

(ii) Using Impulse Invariant mapping, convert the analog transfer function into digital

Assume T = 0.1 sec.

$$H(s) = \frac{2}{(s+1)(s+2)}.$$ (6)

13. (a) (i) Draw the Quantization noise model for a second order system

$H(z) = \dfrac{1}{1 - 2r\cos\theta\, z^{-1} + r^2 z^{-2}}$ and find the steady state output noise variance. (8)

(ii) What are called overflow oscillations? How can it be prevented? (8)

Or

(b) (i) Describe the effect of Quantization on pole location with an example. (6)

(ii) Explain the characteristics of a limit cycle oscillation with respect to the system described by the difference equation

$$y(n) = 0.95y(n-1) + x(n)$$

Determine the Dead band of the filter. (10)

14. (a) (i) Derive the Relationship between autocorrelation and power spectral density of a signal. (8)

(ii) Explain the Bartlett method of spectrum estimation. (8)

Or

(b) (i) Describe the use of DFT in spectrum estimation. (8)

(ii) Explain the Blackman and Tukey method of spectrum estimation. (8)

15. (a) Write note on :

(i) Harvard Architecture

(ii) Dedicated MAC unit

(iii) Multiple ALUs. (16)

Or

(b) Describe the Advanced Addressing modes of DSP processors in detail.
