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Question Paper Code : P 1377

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

Seventh Semester

Computer Science and Engineering

IT 1252 — DIGITAL SIGNAL PROCESSING

(Common to B.E. (Part-Time) Sixth Semester Regulation 2005)

(Regulation 2004)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the advantages of DSP?

2. Define impulse signal.

3. Calculate the DFT sequence $x(n) = \{1, 1, -2, -2\}$

4. List any four properties of DFT.

5. Compare digital and analog filter.

6. Sketch the mapping of s-plane and z-plane in bilinear transformation.

7. Write the steps involved in FIR filter design.

8. Write the expression for Kaiser window function.

9. What are the different formats of fixed point representation?

10. How overflow limit cycles can be eliminated?

PART B — (5 × 16 = 80 marks)

11. (a) Test the stability and causality of the following system

(i) $y(n) = \cos x(n)$. (8)

(ii) $y(n) = x(-n-2)$. (8)

Or

(b) Find the one sided z-transform of discrete sequences generated by mathematically sampling of the following continuous time function.

(i) $x(t) = \sin wt$. (8)

(ii) $x(t) = \cos wt$. (8)

12. (a) (i) Calculate the percentage of saving in calculation in computing a 512-point using radix-2 FFT when compared to direct DFT. (8)

(ii) Draw and explain the basic butterfly diagram of DIF radix-2 FFT. (8)

Or

(b) An 8-point sequence is given by $x(n) = \{2, 2, 2, 2, 1, 1, 1, 1\}$ compute 8 point DFT of $x(n)$ by

(i) Radix-2 DIT-FFT. (8)

(ii) Radix-2 DIF-FFT. (8)

Also sketch the magnitude and phase spectrum.

13. (a) Apply the bilinear transformation for the following :

(i) $H_a(s) = \dfrac{2}{(s+1)(s+2)}$ with $T = 1$ sec find out $H(z)$. (8)

(ii) $H_a(s) = \dfrac{2s}{s^2 + 0.2s + 1}$ with $T = 1$ sec find out $H(z)$. (8)

Or

(b) (i) Compare the impulse invariant and bilinear transformation. (6)

(ii) Explain the design procedure for lowpass digital butterworth IIR filter. (10)

14. (a) Design a lowpass filter using rectangular window by taking 9 samples of $w(n)$ and with cutoff frequency of 1.2 radians/sec. (16)

Or

(b) Design a linear phase lowpass FIR filter with cutoff frequency of $\pi/2$ rad/sec using frequency sampling techniques. (Take $N = 17$). (16)

15. (a) (i) Compare the fixed point and floating point arithmetic, representation and operations. (6)

(ii) What is meant by product quantization error? Draw and explain the product quantization noise model of IIR system with two first order section in cascade. (10)

Or

(b) (i) What are zero I/P and overflow limit cycle? (6)

(ii) Explain the characteristics of the limit cycle in the filter $y(n) = 0.95y(n-1) + x(n)$. Determine the dead band of filter. (10)