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Question Paper Code : 51956

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2014.

Fifth Semester

Medical Electronics Engineering

BM 3302/080290029 — DIGITAL SIGNAL PROCESSING

(Common to Electronics and Communication Engineering)

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. How many multiplications and additions are required to compute N point DFT using Radix -2 FFT?

2. What are the differences and similarities between DIT and DIF algorithms?

3. What is Gibbs Phenomenon?

4. What is the principle of designing FIR filter using frequency sampling method?

5. Why impulse invariant method is not preferred in the design of IIR filter other than low pass filter?

6. Distinguish between recursive realization and non recursive realization.

7. Why is rounding preferred to truncation in realization of digital filters?

8. What is meant by limit cycle oscillations?

9. What is pipelining?

10. List the different buses of TMS 320C5X processor.

PART B — (5 × 16 = 80 marks)

11. (a) (i) List out various properties of the discrete Fourier transform in Time domain. (8)

(ii) Find the output $y(n)$ of a filter whose impulse response in $h(n)=\{1, 1, 1\}$ and input signal $x(n)=\{3, -1, 0, 1, 3, 2, 0, 1, 2, 1\}$ using overlap save method. (8)

Or

(b) (i) Find the 8 point DFT of the sequence $x(n)=\{1,1,1,1,1,0,0,0\}$ using DIT-FFT algorithm. (8)

(ii) Find the 8 point DFT of the sequence $x(n)=\{1,2,2,1,1,2,2,1\}$ using DIF-FFT algorithm. (8)

12. (a) (i) Compare between FIR and IIR filters. (8)

(ii) Using a rectangular window technique design a low pass filter with pass band gain of unity, cutoff frequency of 1000 Hz and working at a sampling frequency of 5 KHz. The length of the impulse response should be 7. (8)

Or

(b) (i) Design a filter with

$$H_d(e^{jw}) = e^{-j3\omega} \quad -\pi/4 \le \omega \le \pi/4$$
$$= 0 \quad \pi/4 \le \omega \le \pi$$

Using a Hamming window with $N = 7$. (8)

(ii) Obtain the cascade realization of the system function $H(z)=(1+2Z^{-1}-Z^{-2})(1+Z^{-1}-Z^{-2})$. (8)

13. (a) Obtain the direct form I, direct form II, Cascade and parallel form realization for the system
$y(n)=-0.1y(n-1)+0.2y(n-2)+3x(n)+3.6x(n-1)+0.6x(n-2)$. (16)

Or

(b) Design a Chebyshev filter for the following specification using (16)

(i) Bilinear transformation

(ii) Impulse invariance method.

$$0.8 \le H(e^{j\omega}) \le 1 \quad 0 \le \omega \le 0.2\pi$$
$$H(e^{j\omega}) \le 0.2 \quad 0.6\pi \le \omega \le \pi$$

14. (a) (i) What is meant by finite word length effects on digital filters? List them. (8)

(ii) A digital system is characterized by the difference equation $y(n) = 0.95\,y(n-1) + x(n)$. Determine the dead band of the system when $x(n) = 0$ and $y(-1) = 13$. (8)

Or

(b) (i) Explain the coefficient quantization in FIR filter. (8)

(ii) A cascaded realization of the two first order digital filters is shown below. The system functions of the individual sections are $H_1(z) = 1/(1 - 0.9z^{-1})$ and $H_2(z) = 1/(1 - 0.8z^{-1})$. Determine the overall output noise power. (8)

15. (a) Discuss the architecture of a TMS 320C50 processor in detail. (16)

Or

(b) (i) List and explain advanced addressing modes in Digital signal processor. (8)

(ii) Explain the basic Harvard architecture with neat block diagram. (8)
