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Question Paper Code : 21181

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

Fifth Semester

Electronics and Communication Engineering

EC 1302 – DIGITAL SIGNAL PROCESSING

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the DFT of the unit step function?
2. What is the number of complex multiplications involved for computing 8 point DFT using DIT FFT algorithm.
3. Write the Hamming window equation used for design of FIR filters.
4. Mention two advantages of IIR filters.
5. What is floating point number representation?
6. Why is signal scaling done?
7. Define autocorrelation.
8. What are random signals?
9. What is VLIW?
10. Mention two instructions used for transfer of data in TMS C54x processors.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Obtain the DFT of the sequence $x(n) = a^n u(n)$, for cases $|a|<1$ and $|a|=1$. (8)

(ii) Prove the convolution property of DFT. (8)

Or

(b) (i) Explain the important features DIT-FFT algorithm. (8)

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

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12. (a) (i) Explain the advantages of FIR filters over IIR filters. (6)

(ii) Design a low pass FIR filter using rectangular window with N=7 and cut off frequency0.5 rad/sec. (10)

Or

(b) (i) Discuss the characteristic features of Butterworth filters. (6)

(ii) Design a digital Butterworth filter with a maximum passband attenuation of 2db at 20 rad/sec and at least –10 dB stop band attenuation at 30 rad/sec using Bilinear transformation method.(10)

13. (a) (i) What is quantization noise. Derive the equation for quantization noise power for uniform quantizer? (6)

(ii) Find the effect of coefficient quantization on the location of poles of the given system in direct form and cascade form with b = 3 bits and $H(z) = 1/\left[\left(1 - 0.5z^{-1}\right)\left(1 - 0.45z^{-1}\right)\right]$. (10)

Or

(b) Explain zero input limit cycle oscillations. Study the limit cycle behaviour of the system $y(n) = x(n) + a\, y(n-1)$ with a = ½ and data register length is 3 bits plus a sign bit and input $x(n) = \begin{cases} 0.875 & \text{for } n = 0 \\ 0 & \text{for } n \text{ otherwise} \end{cases}$. (16)

14. (a) (i) Define energy density spectrum of a signal and explain how it can be determined. (8)

(ii) What is periodogram? Derive its equation for a random discrete time signal and explain how DFT can he used to obtain power spectrum. (8)

Or

(b) Describe the steps involved in computation of power spectrum using Bartlett and Welch methods. Compare the methods in terms of number of computations and variance. (16)

15. (a) (i) Describe the features of the Harvard architecture. (8)

(ii) Explain the function of the MAC unit in the DSP processor architecture. (8)

Or

(b) (i) Explain the stages involved in pipelining. (8)

(ii) Explain the various addressing modes used in TMS 32OC5x DSP processors. (8)

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