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Question Paper Code : 11370

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2012.

Fifth Semester

Electronics and Communication Engineering

EC 1302 — DIGITAL SIGNAL PROCESSING

(Regulation 2008)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Find the DFT of $y(n) = \delta(n) - \delta(n-n_0) + \delta(n+n_0)$?

2. What is radix 2 FFT?

3. Mention two important features of Butterworth filters.

4. What is the condition for FIR filters to have linear phase?

5. What is overflow error?

6. Represent 1/16 as a binary floating point number.

7. Define autocorrelation and power spectral density.

8. What are the disadvantages of nonparametric methods?

9. Mention two advantages of Harvard architecture.

10. What is stack addressing? Give an example of instruction used for this purpose.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Compute the 5 point DFT of the signal x(n) = { 2, 1, 3, 0, 4} (8)

(ii) State and prove the multiplication in time property of DFT. (8)

Or

(b) (i) Explain the salient features of the 8 point Decimation in time FFT algorithm. Explain the advantages of FFT over direct computation of DFT. (8)

(ii) Use the flow graph of 8 point DIT-FFT to compute the DFT of the sequence

x(n) = { 1, 2, 3, 4, 4, 3, 2, 1} (8)

12. (a) A Butterworth Low pass filter has to meet the following specifications: Passband gain of – 1dB at 4 rad/sec, stopband attenuation greater than 20dB at 8 rad/sec. Determine the transfer function of the lowest order Butterworth filter to meet the above specifications. (16)

Or

(b) (i) Explain how mapping between S plane and Z plane is done using Bilinear transformation method. (8)

(ii) Describe the characteristics of the various windows used for design of FIR filters. (8)

13. (a) (i) Explain limit cycle oscillations. (6)

(ii) Study the limit cycle oscillations of the system y(n) = 0.95 y(n-1) + x(n) where the product is quantized by rounding to 4 bits and sign magnitude representations is used. Also determine the dead band of the system. (10)

Or

(b) (i) The input to the system y(n) = 0.999 y(n-1) + x(n) is applied to an ADC. What is the output quantization noise power of the filter if the input is quantized to 8 bits. (8)

(ii) What is coefficient quantization error? Explain its effect in digital filters. (8)

14. (a) (i) Explain the use of DFT in power spectrum estimation. (6)

(ii) Describe the Bartlett and Welch methods of power spectrum estimation. (10)

Or

(b) (i) Define energy density spectrum and explain how it can be computed for deterministic signals. (8)

(ii) Explain the Blackman and Turkey method of power spectrum estimation. Compare its features with the other Non parametric methods. (8)

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

(ii) Explain the functions of the Multiply and accumulate unit. (8)

Or

(b) (i) Describe the concept of pipeline and the stages of pipelining used in DSP architectures. (6)

(ii) Explain the function of the control and arithmetic logic unit, parallel logic unit and auxillary register unit of the TMS320C5X processor. (10)
