Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 86570

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Fifth Semester

Electronics and Communication Engineering

EC 1302 — DIGITAL SIGNAL PROCESSING

(Regulations 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Distinguish between DFT and DTFT.
2. Write any two properties of DFT.
3. Write the Hamming window equation used for design of FIR filters.
4. Mention two advantages of IIR filters.
5. What is the possible range of numbers in the fixed point-arithmetic?
6. What is meant by quantization of analog signals?
7. Write the underlying principle of Power Spectral Density estimation.
8. Give the features of Tukey method of PSD estimation.
9. Can embedded general-purpose RISC processors be used as DSP? Justify.
10. Describe about Harvard architecture.

PART B — ($5 \times 16 = 80$ marks)

11. (a) (i) Determine the 6-point DFT of the signal (10)
$x(n) = \{3, 2,1 ,0, 1, 2\}$.

(ii) Represent DFT and IDFT in matrix form. (6)

Or

(b) Develop 8-point radix-2 decimation in time algorithm with input in normal order and output in digit reversed order. Derive the necessary equations and show the flow diagrams.

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 frequency 0.5 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) Explain how fixed point representations are different from floating Point representation. Compare them in terms of truncation and rounding-off error. (16)

Or

(b) What is quantisation noise? Mention their causes/sources Derive the expression for quantisation noise power. Comment on the obtained expression. (16)

14. (a) (i) Let x1(n) and x2(n) be uncorrelated signals. Show that if x(n) = x1(n) + x2(n) then $\mu x = \mu x1 + \mu x2$ and $\sigma_x^2 = \sigma_{x1}^2 + \sigma_{x2}^2$. (8)

(ii) Write a detailed technical note on the use of DFT in power spectrum estimation. (8)

Or

(b) (i) The N-Point DFT of a random sequence $x(n)$ is, $X(k) = \sum_{n=0}^{(N-1)} x(n)\, e^{-j2\pi k n / N}$. Determine the variance and autocorrelation of $X(k)$. (8)

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

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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