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

Question Paper Code : 80448

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

Fifth Semester

Electronics and Communication Engineering

EC 2302/EC 52 — DIGITAL SIGNAL PROCESSING

(Regulations 2008)

(Common to PTEC 2302 – Digital Signal Processing for B.E. (Part-Time) Fourth Semester – Electronics and Communication Engineering – Regulations 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Find the 4–point DFT of the sequence $x(n) = \{1, 1, -1, -1\}$.

2. What is meant by in-place Computation?

3. Distinguish between Butterworth and Chebyshev filter.

4. What is prewarping?

5. State the properties of FIR filter.

6. Give the desirable characteristics of the window.

7. State the need for scaling in filter implementation.

8. What is product round-off noise?

9. State the various applications of DSP.

10. What is echo cancellation?

PART B — (5 × 16 = 80 marks)

11. (a) With appropriate diagrams describe

(i) overlap-save method (8)

(ii) overlap-add method. (8)

Or

(b) Explain Radix-2 DIF-FFT algorithm. Compare it with DIT-FFT algorithms. (16)

12. (a) Design a low pass Butterworth digital filter with the following specifications :

$W_S = 4000, W_P = 3000$

$A_P = 3$ dB, $A_S = 20$ dB, $T = 0.0001$ sec. (16)

Or

(b) A system is represented by a transfer function $H(z)$ is given by

$$H(z) = 3 + \frac{4z}{z - 1/2} - \frac{z}{z - 1/4}$$

(i) Does this $H(z)$ represent a FIR or IIR filter why? (4)

(ii) Give a difference equation realization of this system using direct form – I. (6)

(iii) Draw the block diagram for the direct form II canonic realization, and give the governing equations for implementation. (6)

13. (a) (i) Explain briefly how the zeros in FIR filter is located. (7)

(ii) Using a rectangular window technique, design a low pass filter with pass band gain of unity, out-off frequency of 1000 Hz and working at a sampling frequency of 5 kHz. The length of the impulse response should be 7. (9)

Or

(b) Consider an FIR lattice filter with coefficients $k_1 = 1/2; k_2 = 1/3; k_3 = 1/4$. Determine the FIR filter coefficients for the direct form structure. (16)

14. (a) Discuss the following:

(i) Product quantization error (8)

(ii) Limit cycle oscillations. (8)

Or

(b) (i) Derive the equation for rounding and truncation errors. (8)

(ii) Derive the equation for quantization noise power. (8)

15. (a) (i) Explain the multistage implementation of sampling rate conversion with a block diagram. (8)

(ii) A signal $x(n)$ is given by $x(n) = \{0, 1, 2, 3, 4, 5, 6, 0, 1, 2, 3, ...\}$. (8)

(1) Obtain the decimated signal with a factor of 2.

(2) Obtain the interpolated signal with a factor of 2.

Or

(b) Explain sampling rate increase by an integer factor I and derive the input-output relationship in both time and frequency domains.

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