

CBCS SCHEME

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17EC52

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Digital Signal Processing

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Show that finite duration sequence of length L can be reconstructed from the equidistant N samples of its Fourier transform, where $N \geq L$. (06 Marks)
- b. Compute the 6-point DFT of the sequence $x(n) = \{1, 0, 3, -1, 3, 0\}$. (08 Marks)
- c. Find the N -point DFT of the sequence $x(n) = a^n$, $0 \leq n \leq N-1$. (06 Marks)

OR

- 2 a. Determine the 6-point sequence $x(n)$ having the DFT $X(K) = \{12, -3 - j\sqrt{3}, 0, 0, 0, -3 + j\sqrt{3}\}$. (08 Marks)
- b. Derive the equation to express z -transform of a finite duration sequence in terms of its N -point DFT. (06 Marks)
- c. Compute the circular convolution of the sequences $x_1(n) = \{1, 2, 2, 1\}$ and $x_2(n) = \{-1, -2, -2, -1\}$. (06 Marks)

Module-2

- 3 a. State and prove the modulation property (multiplication in time-domain) of DFT. (06 Marks)
- b. The even samples of an eleven-point DFT of a real sequence are : $X(0) = 8$, $X(2) = -2 + j3$, $X(4) = 3 - j5$, $X(6) = 4 + j7$, $X(8) = 5 - j9$ and $X(10) = \sqrt{3} - j2$. Determine the odd samples of the DFT. (06 Marks)
- c. An LTI system has impulse response $h(n) = \{2, 1, -1\}$. Determine the output of the system for the input $x(n) = \{1, 2, 3, 3, 2, 1\}$ using circular convolution method. (08 Marks)

OR

- 4 a. State and prove circular time reversal property of DFT. (06 Marks)
- b. Determine the number of real multiplications, real additions, and trigonometric functions required to compute the 8-point DFT using direct method. (04 Marks)
- c. Find the output $y(n)$ of a filter whose impulse response is $h(n) = \{1, 2, 1\}$, and the input is $x(n) = \{1, 2, 0, 1, 3, 2, 0, 1, 2, 1\}$ using overlap-add method, taking $N = 6$. (10 Marks)

Module-3

- 5 a. Compute the 8-point DFT of the sequence $x(n) = \cos(\pi n/4)$, $0 \leq n \leq 7$, using DFT-FFT algorithm. (10 Marks)
- b. Given $x(n) = \{1, 2, 3, 4\}$, compute the DFT sample $X(3)$ using Goestzel algorithm. (06 Marks)
- c. Determine the number of complex multiplications and complex additions required to compute 64-point DFT using radix-2 FFT algorithm. (04 Marks)

1 of 2

Important Note: 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any involving of identification, appeal to evaluate and/or equations written eg. Q-8-9), will be treated as malpractice.

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Table of Contents Dsp Question Papers

1. Understanding the eBook Dsp Question Papers
 - The Rise of Digital Reading Dsp Question Papers
 - Advantages of eBooks Over Traditional Books
2. Identifying Dsp Question Papers
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Dsp Question Papers
 - User-Friendly Interface
4. Exploring eBook Recommendations from Dsp Question Papers
 - Personalized Recommendations
 - Dsp Question Papers User Reviews and Ratings
 - Dsp Question Papers and Bestseller Lists
5. Accessing Dsp Question Papers Free and Paid eBooks
 - Dsp Question Papers Public Domain eBooks
 - Dsp Question Papers eBook Subscription Services
 - Dsp Question Papers Budget-Friendly Options

6. Navigating Dsp Question Papers eBook Formats
 - ePub, PDF, MOBI, and More
 - Dsp Question Papers Compatibility with Devices
 - Dsp Question Papers Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Dsp Question Papers
 - Highlighting and Note-Taking Dsp Question Papers
 - Interactive Elements Dsp Question Papers
8. Staying Engaged with Dsp Question Papers
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Dsp Question Papers
9. Balancing eBooks and Physical Books Dsp Question Papers
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Dsp Question Papers
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Dsp Question Papers
 - Setting Reading Goals Dsp Question Papers
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Dsp Question Papers
 - Fact-Checking eBook Content of Dsp Question Papers
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements

- Interactive and Gamified eBooks

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