

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 $X(k) = \{12, -3 - j\sqrt{3}, 0, 0, 0, -3 + j\sqrt{3}\}$. (06 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 : $X(0) = 8$, $X(2) = -2 + j3$, $X(4) = 3 - j5$, $X(6) = 4 + j2$, $X(8) = -5 - j9$ 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 $x(n) = \{3, -1, 0, 1, 3, 2, 0, 1, 2, 1\}$ 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 DIT-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)

Digital Signal Processing Question Paper

Patrick Gaydecki



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