

## 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

**Rosina Ehmann**



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