Total No. of Questions : 8] *[Total No. of Printed Pages : 2*

Roll No .....

EC-6002 (CBGS)

B.E. VI Semester

Examination, May 2019

Choice Based Grading System (CBGS)

Digital Signal Processing

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.
ii) All questions carry equal marks.

1. a) For the following systems, determine whether or not the system is time-invariant. 6

   i) $y(n) = n\,x(n)$ ii) $y(n) = x(2n)$

   iii) $y(n) = e^{x(n)}$

   b) Test if the following systems are causal or not. 6

   i) $y(n) = x(n) + x^2(n-1)$

   ii) $y(n) = x(n+1) + 3x(n) + 5x(n-1)$

   iii) $y(n) = x(2n)$

   c) What is the condition of stability of a system in terms of impulse response? 2

2. a) Find the Fourier transform of following signals. 6

   i) $x_1(n) = \left\{1, 1, \underset{\uparrow}{1}, 1, 1\right\}$

   ii) $x_2(n) = \left\{1, 0, 1, 0, \underset{\uparrow}{1}, 0, 1, 0, 1\right\}$

   b) State and explain any 4 properties of z-transform. 8

3. a) Determine the z-transform and sketch the RoC of the following signals. 8

$$x(n) = \begin{cases} \left(\frac{1}{3}\right)^n, & n \geq 0 \\ \left(\frac{1}{2}\right)^{-n}, & n < 0 \end{cases}$$

   b) Find the state variable matrices A, B, C, D for the equation 6
   $y(n) - 3y(n-1) - 2y(n-2) = x(n) + 5x(n-1) + 6x(n-2)$

4. a) What are the properties of Discrete Fourier Series? Explain. 10

   b) Find the DFT of the non-causal signal 4

   $x(n) = \frac{1}{3}$ for $-1 \leq n \leq 1$

5. a) Compute the circular convolution of the sequences. 6
   $x_1(n) = \{1, 2, 0, 1\}$
   $x_1(n) = \{2, 2, 1, 1\}$

   b) What is decimation in-time algorithm? Explain for a 8-point sequence. http://www.rgpvonline.com 8

6. a) Compute the 8-point DFT of the sequence $x(n) = \{2, 1, 2, 1, 2, 1\}$ using DIF algorithm. 8

   b) How is FFT computed for a composite number? Explain using flow graph for a sequence of length 6. 6

7. a) Describe the impulse invariance method of designing IIR filters. 8

   b) What are window functions? Explain any three window functions in detail. 6

8. Write short notes on any two topics. 14
   a) Differencfe between FIR and IIR filters.
   b) Computational requirements of radix-2 FFT algorithm.
   c) Signal flow graph representation of digital network.
   d) Classification of systems.
   e) Bilinear transformation

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