

**5E5107**

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**B.Tech. V Semester (Main/Back) Examination, Nov./Dec. - 2017**  
**Computer Science & Engineering**  
**5CS6.2A Digital Signal Processing**  
**CS IT**

**Time : 3 Hours****Maximum Marks : 80****Min. Passing Marks : 26****Instructions to Candidates :**

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*Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly). Units of quantities used/calculated must be stated clearly.*

**Unit - I**

1. a) What is system? Explain the basic properties of system. (8)
- b) The system gives below have input  $x[n]$  and output  $y[n]$  respectively. Determine whether each of them is (8)
- i) Stable
  - ii) Causal
  - iii) Linear
  - iv) Time invariant  $y(n) = 2 \times [n] U [n]$ .

**OR**

1. a) Consider a causal LTI system whose input  $x[n]$  and output  $y[n]$  are related by the difference equation.

$$y[n] = \frac{1}{4}y[n-1] + x[n]$$

Determine  $y[n]$ , if  $x[n] = f[n-1]$  (8)

- b) Obtain the convolution of the following sequences.

$$x(n) = U(n), \quad h(n) = 2^n U(n) \quad (8)$$

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## Unit - II

2. a) Determine the Fourier transform of the following signal.
- $x(n) = U(n) - U(n-6)$
  - $x(n) = 2^n U[-n]$  (8)
- b) Define the z-transform. Explain the various properties of z-transform in brief. (8)

OR

2. a) Determine the inverse z-transform by using partial fraction expansion method.

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$$x(z) = \frac{z}{\left(z - \frac{1}{2}\right)\left(z - \frac{1}{4}\right)} \quad (8)$$

- b) Discuss various properties of DTFT in brief. (8)

## Unit - III

3. a) What is aliasing phenomenon? How can aliasing be eliminated (8)
- b) What is sampling process? Define and prove the sampling theorem. (8)

OR

3. Determine the Nyquist rate corresponding to each of the following signals.

i)  $x(t) = 1 + \cos(2000\pi t) + \sin(4000\pi t)$

ii)  $x(t) = \sin\left(\frac{4000\pi}{\pi t}\right)$

iii)  $x(t) = \left(\frac{\sin(4000\pi t)}{\pi t}\right)^2$

iv)  $x(t) = \frac{1}{2\pi} \cos(4000\pi t) \cos(1000\pi t)$  (16)

## Unit - IV

4. a) Given  $x[n] = \{0, 1, 2, 3, 4, 5, 6, 7\}$ . Determine DFT using DIT - FFT Algorithm. (8)
- b) Explain the properties of the DFT. (8)

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OR

4. a) Compute 8-point DFT of  $x(n) = n+1$  using DIT - FFT algorithm. (8)
- b) Define the convolution. Explain linear convolution. (8)

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5. Obtain the Cascade and parallel form structure for

$$H(z) = \frac{(1-z^{-1})^3}{\left(1-\frac{1}{2}z^{-1}\right)\left(1-\frac{1}{8}z^{-1}\right)} \quad (16)$$

**OR**

5. Design the Chebyshev high pass filter for the following filter specification

pass band attenuations = 1 dB

stop band attenuations = 10 dB

pass band edge frequency = 0.6498 rad/sec

stop band edge frequency = 0.0314 rad/sec

**(16)**

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