

5E5107

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[Total No. of Pages : 3]

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
rtuonline.com

Instructions to Candidates :

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.

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

Unit - II

2. a) Determine the Fourier transform of the following signal.
- $x(n) = U(n) - U(n - 6)$
 - $x(n) = 2^n U[-n]$
- 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.

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

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

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)

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)

Unit - V

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)

