

7E7072

Roll No. _____

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B. Tech. VII - Sem. (Back) Exam., Feb.-March - 2021
Applied Electronics & Instrumentation Engineering
7AI2 Digital Signal Processing
AI, EC, EIC

Time: 2 Hours

www.ersahilkagyan.comMaximum Marks: 48
Min. Passing Marks: 15**Instructions to Candidates:**

Attempt three questions, selecting one question each from any three 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.

Use of following supporting material is permitted during examination.
(Mentioned in form No.205)

1. NIL2. NIL**UNIT- I**

- Q.1 (a) Explain Sampling theorem. Give necessary condition of sampling ✓ [8]
(b) Discuss the method of continuous time processing of discrete time signals. [8]

OR

- Q.1 What are sampling rate alteration devices? How can we increase or decrease the sampling rate using discrete time processing? [16]

UNIT- II

- Q.2 (a) Obtain a linear convolution of following two discrete time signals - [8]

$$x(n) = \sum_{k=0}^2 \delta(n-k)$$

- (b) State and explain properties of linear convolution. [8]

OR

- Q.2 Find out the particular solution for the following differential equation - [8×2=16]

(a) $y(n) + 3y(n-1) = x(n)$

(b) $y(n) + 3y(n-1) - 4y(n-2) = x(n)$

UNIT- III

- Q.3 (a) Draw and explain block diagram representation for discrete time LTI system. [8]
(b) Draw the block diagram representation in direct form, cascade form for following LTI system expressed by transfer function. [8]

$$H(z) = \frac{1}{(1 + \frac{1}{2}z^{-1})(1 - \frac{1}{2}z^{-1})}$$

OR

- Q.3 (a) What are IIR and FIR filters? Draw basic structures for them and explain. [8]
(b) List out the advantages and disadvantages of digital filters over analog filters. [8]

UNIT- IV

- Q.4 Determine $H_d(z)$ using impulse invariance method at 5Hz sampling frequency from $H_a(s)$ as given below. [16]

$$H_a(s) = \frac{z}{(s+1)(s+2)}$$

OR

- Q.4 (a) Explain design technique of FIR filters using - [12]
(i) Rectangular window
(ii) Hanning window
(iii) Kaiser window
(b) Using Chebyshev filter approximation explain type I filter design. [4]

UNIT- V

- Q.5 (a) What is Discrete Fourier Transform? List out the properties of DFT. [6]
(b) Compute N-point DFT of the following exponential sequence - [10]

$$x(n) = a^n u(n) \quad \text{for } 0 \leq n \leq N-1$$

OR

- Q.5 Determine the 8 point DFT of the following sequence - [16]

$$x(n) = \left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, 0, 0, 0, 0 \right]$$