

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE - SEMESTER-VII (NEW) EXAMINATION – WINTER 2022**

Subject Code:3171708

Date:03-01-2023

Subject Name:Digital Signal Processing (IC)

Time:10:30 AM TO 01:00 PM

Total Marks:70

**Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
<b>Q.1</b>	(a) Draw block diagram of Digital Signal Processing & compare Digital signal processing over Analog signal Processing	<b>03</b>
	(b) Explain effects of quantization of the filter Co-efficient and discuss how to minimize it.	<b>04</b>
	(c) Explain block diagram and signal flow diagram representations of Linear Constant-Coefficient Difference Equations.	<b>07</b>
<b>Q.2</b>	(a) List basic structures of IIR systems and explain any one in brief	<b>03</b>
	(b) Compute the DFT of the following: (1) $x(n) = \delta(n)$ (2) $x(n) = \delta(n - n_0)$	<b>04</b>
	(c) Realize given system in cascade form $H(Z) = (1 + \frac{1}{2} z^{-1} + z^{-2})(1 + \frac{1}{4} z^{-1} + z^{-2})$	<b>07</b>
<b>OR</b>		
	(c) Consider LTI system with system function, draw its direct form-II structure. $H(Z) = \frac{1 + \frac{1}{5} z^{-1}}{[1 - 0.5 z^{-1} + \frac{1}{3} z^{-2}][1 + 0.25 z^{-1}]}$	<b>07</b>
<b>Q.3</b>	(a) State & Prove linearity property of DFT.	<b>03</b>
	(b) Determine IDFT of $X(k) = \{4, 1-j, -2, 1+j\}$	<b>04</b>
	(c) Explain symmetry properties of DFT.	<b>07</b>
<b>OR</b>		
<b>Q.3</b>	(a) Show relationship between Z transform and DFT.	<b>03</b>
	(b) Draw 4 point DIF-FFT butterfly diagram.	<b>04</b>
	(c) List methods for filtering of long data sequence. Explain any one in detail.	<b>07</b>
<b>Q.4</b>	(a) Explain the term radix in FFT.	<b>03</b>

(b) Draw 4 point DIT-FFT butterfly diagram. **04**

(c) Using decimation in time (DIT) radix-2 algorithm, compute 8 point DFT for the sequence **07**

$$x(n) = \begin{cases} 1, & 0 \leq n \leq 7 \\ 0, & \text{otherwise} \end{cases}$$

**OR**

**Q.4** (a) Write advantages of the FFT algorithm. **03**

(b) Find the DFT of the sequence  $x(n)=\{1,0,0,1\}$  using DIF-FFT algorithm. **04**

(c) Obtain circular convolution of  $x_1(n) = \{1,1,2,1\}$  &  $x_2(n) = \{1,2,3,4\}$  **07**

**Q.5** (a) Enlist difference between FIR and IIR Filter **03**

(b) The transfer function of analog filter is **04**  
 $H(s) = 3 / (s+2)(s+3)$  with  $T_s = 0.1$  sec  
Design IIR filters using bilinear transformation

(c) Find out  $y(n)$  of a filter whose impulse response is  $h(n)=\{1,2\}$  &  $x(n)=\{1,2,-1,2,3,-2,-3,-1,1,1,2,-1\}$  using overlap save method. **07**

**OR**

**Q.5** (a) Give Difference between the Bilinear Transform and Impulse Invariance methods **03**

(b) Explain any one windowing Method for FIR filter design in brief. **04**

(c) Explain Impulse Invariance Method for IIR filter design **07**

\*\*\*\*\*