GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2023

Subject Code:3171708   **Date:12-12-2023**
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
Q.1	**(a)**	Draw block diagram of Digital Signal Processing & compare Digital signal processing over Analog signal Processing.	**03**
	(b)	Block Diagram and signal flow diagram representations of Linear Constant-Coefficient different equations.	**04**
	(c)	Explain Sampling theorem in detail?	**07**
Q.2	**(a)**	What are the advantages of designing filter using digital signal processing?	**03**
	(b)	Consider the analog signal Xa(t)=3 cos 100πt (a) Determine the minimum sampling rate required to avoid aliasing. (b) Suppose that the signal is sampled at the rate Fs = 200 Hz What is the discrete-time signal obtained after sampling?	**04**
	(c)	Explain Direct form - I structure of IIR system in brief.	**07**
		OR	
	(c)	Explain Direct form - II structure of IIR system in brief.	**07**
Q.3	**(a)**	List different application of DSP. Explain any one in detail.	**03**
	(b)	Explain any four properties of Discrete Fourier Transform.	**04**
	(c)	Determine the impulse response h(n) for the system described by the second-order difference equation y(n)-3y(n-1)-4y(n-2) = x(n)+2x(n-1).	**07**
		OR	
Q.3	**(a)**	Show relationship between Z transform and DFT.	**03**
	(b)	Prove the linearity and time shifting properties of Fourier Transform.	**04**
	(c)	Realize an FIR system $$y(n) + 2y(n-1) + 3y(n-2) = 4x(n) + 5x(n-1) + 6x(n-2)$$ Using the transposed form structure.	**07**
Q.4	**(a)**	Enlist difference between FIR and IIR Filter	**03**
	(b)	Discuss about Decimation in Frequency algorithm of FFT.	**04**
	(c)	Determine the direct form I and form II realization for following system Y(n)=x(n) - x(n-1) + 2 x (n-2) -3 y(n-1) + 4y(n-2)	**07**
		OR	
Q.4	**(a)**	Explain the term radix in FFT.	**03**
	(b)	Compute 4-point DFT of the given sequence x]n[= {1,0,1,0}	**04**
	(c)	Derive the lattice structures of FIR filters.	**07**
Q.5	**(a)**	With reason explain prewarping procedure during filter design.	**03**
	(b)	Draw 4 point DIT-FFT butterfly diagram.	**04**
	(c)	Perform the circular convolution of two sequence X1(n) = {1,3,5,3} and X2(n) = {2,3,1,1}	**07**

OR

Q.5 **(a)** Write advantages of the FFT algorithm. **03**

(b) Determine auto-correlation of the following signal: **04**
x(n) = {1 ,2, 1, 1}.

(c) Derive the frequency sampling structures of IIR filters. **07**

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