Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– VII (OLD) EXAMINATION – WINTER 2021

Subject Code:171003   **Date:29/11/2021**

Subject Name:Digital Signal Processing

Time:02:30 PM TO 05:00 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.**

Q.1	**(a)**	Attempt following questions.	**06**
		1) Explain architecture for Digital Signal Processor with its key features in detail.	
	(b)	Classify the following systems.	**08**
		1) Static Vs Dynamic systems	
		2) Recursive Vs non-recursive systems	
		3) Linear Vs non linear systems	
		4) Time Variant Vs Time Invariant systems	
Q.2	**(a)**	Determine convolution of given discrete time sequences with graphical approach. $x(n) = \{3,11,7,0,-1,4,2\}$ for n = -3 : 3 and $h(n) = \{2,3,0,-5,2,1\}$ for n= -1:4.	**07**
	(b)	Determine impulse response of following LTI systems described by the following second order difference equation. $y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2\,x(n-1)$	**07**
		OR	
	(b)	Discuss various properties of DTFT. Also compare DTFT with DFT. Why DFT is better?	**07**
Q.3	**(a)**	Discuss following properties of Z-Transform in detail with proof.	**07**
		1) Convolution	
		2) Differentiation	
		3) Time Shifting	
	(b)	Describe the properties of ROC in context with Z-Transform and determine the Z-Transform of given signal. $x(n) = u(n) - u(n-20)$	**08**
		OR	
Q.3	**(a)**	What is the need of Transformation on any signal? Compare Z Transform with DFT and FFT with examples.	**07**
	(b)	Determine Partial Fraction Expansion of $X(z) = (1 + z^{-1}) / (1 - z^{-1} + 0.5\,z^{-2})$	**07**
Q.4	**(a)**	Compute Circular convolution of following discrete time sequences. $x(n) = \{1,2,2\}$ and $h(n) = \{1,2,3,4\}$	**07**
	(b)	Obtain direct form I & II, cascade and parallel form structures for the given system $y(n) = \tfrac{1}{2}\,y(n-1) + \tfrac{1}{4}\,y(n-2) + 2\,x(n) - x(n-1)$	**07**
		OR	
Q.4	**(a)**	Justify the following statement: Multiplication of Two DFTs is circular convolution in Time Domain. Derive relevant equations.	**07**
	(b)	Compute 4 point DFT of a given discrete sequence using Radix-2 DIF FFT	**07**

algorithm.

$x(n) = \{ 1,2,3,4 \}$

Q.5 **(a)** Explain Radix 2 DIT FFT algorithm for computing 8 point DFT. Derive all necessary equations and signify importance of bit reversal table in it. **07**

(b) List out benefits of Digital filter over Analog filters. Discuss parameters and their importance in designing any practical frequency selective filter. **07**

OR

Q.5 **(a)** Discuss BLT with regard to IIR filter design. Why is it more efficient than Impulse Invariance approach? **07**

(b) How FFT is computationally more efficient than DFT? Under which set of parameters comparison between these algorithms are possible? Comment on efficiency of FFT against DFT. **07**

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