Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VII (NEW) EXAMINATION – WINTER 2021

Subject Code:2171708 **Date:25/11/2021**

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.**

			MARKS
Q.1	**(a)**	Explain sampling theorem in detail.	**03**
	(b)	Classify discrete time systems with respective supportive details.	**04**
	(c)	Perform the circular convolution of two sequence $x_1(n) = \{1,3,5,3\}$ and $x_2(n) = \{2,3,1,1\}$	**07**
Q.2	**(a)**	Check the time variance of given systems. 1. $y(n) = x(n) \cos w_0 n$ 2. $y(n) = x(n)\, u(n)$	**03**
	(b)	Check the linearity of given systems. 1. $y(n) = x(n) \cos w_0 n$ 2. $y(n) = x(n)\, u(n)$	**04**
	(c)	Determine $r_{xy}(l)$ and $r_{yx}(l)$ of given sequences. $x(n) = \{-3, -2, 1, 4, 8, -3\}$ $y(n) = \{1, 1, \underset{\uparrow}{1}, -1, 2, -2\}$	**07**
		OR	
	(c)	Determine zero input response of system described by homogeneous second order difference equation $y(n) - 3\, y(n-1) - 4\, y(n-2) = 0.$	**07**
Q.3	**(a)**	State and explain initial and final value theorem in Z transformation.	**03**
	(b)	Derive the Z transformation for $x(n) = a^n (\sin w_0 n)\, u(n)$	**04**
	(c)	Determine inverse Z transformation by power series expansion method. $X(z) = 1/(1 - 1.5 z^{-1} + 0.5 z^{-2})$ For ROC $\lvert z\rvert > 1$ and ROC $\lvert z\rvert < 0.5$	**07**
		OR	
Q.3	**(a)**	Determine causality of the given systems. 1. $x(n) = x(n-5)$ 2. $x(n) = x(n+5)$ 3. $x(n) = x(-n)$	**03**
	(b)	Determine Z transformation of Signal $x(n) = n\, a^n\, u(n)$	**04**
	(c)	List out the properties of Z transformation with suitable detail.	**07**
Q.4	**(a)**	Compute the DFT of sequence $x(n) = 1/3$ (for $0 \le n \le 2$ and zero elsewhere)	**03**
	(b)	Explain impulse invariance method.	**04**
	(c)	Explain linear phase FIR structure with necessary sketch and derivations.	**07**

OR

Q.4	**(a)**	Compute the DFT of sequence $x(n) = \{\underset{\uparrow}{1}, 0, 0, 1\}$	**03**
	(b)	Explain bilinear transformation method.	**04**
	(c)	Explain lattice structure for IIR system with necessary sketch and derivations.	**07**
Q.5	**(a)**	Detrmine the IDFT of $X[k] = \{2, 1+j, 0, 1-j\}$	**03**
	(b)	Explain parseval's theorem for DFT.	**04**
	(c)	Enumerate 8 point decimation in time FFT algorithm.	**07**

OR

Q.5	**(a)**	Explain time reversal of a sequence in DFT.	**03**
	(b)	Explain symmetry properties of DFT for real and odd as well as real and even sequences.	**04**
	(c)	Enumerate 8 point decimation in frequency FFT algorithm.	**07**

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