Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER- VII EXAMINATION-SUMMER 2023

Subject Code: 3171003 Date: 22/06/2023

Subject Name: Digital Signal Processing

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)**	State the properties of convolution.	**03**
	(b)	Compute DTFT of given sequence x(n) = {1, 2,3,4} ↑	**04**
	(c)	What is BIBO stable system? Give derivation in support to the necessary condition for BIBO stable system.	**07**
Q.2	**(a)**	Classify various discreet systems.	**03**
	(b)	What is minimum phase system? Explain in brief.	**04**
	(c)	Check the stability and causality of the system describe by impulse response $h(n) = 5^n u(3-n)$	**07**
		OR	
	(c)	Find linear and circular convolution of the sequences x(n)={1,2,3,4} and h(n)={2,1,2,1}.Compare it and write your comment.	**07**
Q.3	**(a)**	Find the Z transform of the given system y(n) =u(n)+2u(n-1)- 4u(n-2) + u(n-3)	**03**
	(b)	State and prove scaling property of Z transform.	**04**
	(c)	Determine the response of the system, y(n)=(5/6)y(n-1)-(1/8)y(n-2)+x(n), to the input signals x(n)=δ(n)-(1/3)δ(n-1)	**07**
		OR	
Q.3	**(a)**	Find the Z transform of the given signal $x(n) = na^n u(n)$	**03**
	(b)	State and prove time shifting property of Z transform.	**04**
	(c)	If y(n)= 0.85y(n-1) + 0.15x(n) is system difference equation then find output for input x(n)=u(n).	**07**
Q.4	**(a)**	List the advantages of representing the Discreet time system in block diagram form.	**03**
	(b)	Compare direct form I and direct form II structure of filter realization.	**04**
	(c)	Realize the system described by following difference equation using direct form II structure. $y(n) = y(n-1) - \frac{1}{2}y(n-2) + x(n) - x(n-1) + x(n-2)$	**07**
		OR	
Q.4	**(a)**	Write steps to convert block diagram realization of Discreet Time System into signal flow graph.	**03**

	(b)	Briefly explain effect of coefficient quantization in filters.	**04**
	(c)	Obtain the system function H (z) and difference equation for h (n) = {1,-2,-2, 3}. Draw the filter structure.	**07**
Q.5	**(a)**	Compute 4 point DFT of x(n)={0,1,2,3} using linear transformation.	**03**
	(b)	Find out H(z) for the given H(s) = 2/(s2+ 3s +2) using impulse invariance method. Take T= 1s	**04**
	(c)	Derive the RADIX 2 structure of Decimation In Frequency Fast Fourier Transform with butterfly diagram and also bit reversal table. Comment of Computational Complexity of it.	**07**

OR

Q.5	**(a)**	Calculate 4 point DFT of sequence $x(n) = \cos(n\pi/2)$ for n=0,1,2,3	**03**
	(b)	Compare any two Windowing techniques used in FIR filter.	**04**
	(c)	Explain impulse invariance method for designing digital IIR filter.	**07**

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