GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VII (OLD) EXAMINATION – SUMMER 2024

Subject Code:171003   **Date:24-05-2024**

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)**	Draw the block diagram of a typical discrete time system and explain in brief. What are the advantages and disadvantages of digital signal processing over analog signal processing ?	**07**
	(b)	State and explain the conditions followed by all LTI (Linear Time Invariant) systems in general giving one example each of LTI and non-LTI systems.	**07**
Q.2	**(a)**	Classify the following systems. i) Linear Vs nonlinear systems ii) Time Variant Vs Time Invariant systems	**07**
	(b)	List the properties of the Z transform with its ROC.	**07**
		OR	
	(b)	List the properties of the region of convergence for the Z transform.	**07**
Q.3	**(a)**	Determine Z-Transform and ROC of the following sequence.	**07**

$$x(n) = \left(-\frac{1}{3}\right)^n u(n) - \left(\frac{1}{2}\right)^n u(-n-1)$$

	(b)	Give classification of signals with examples.	**07**
		OR	
Q.3	**(a)**	A system has an impulse response h[n] = {1,2,3} and output response y[n] = {1,1,2, -1,3}. Determine the input sequence x[n].	**07**
	(b)	Discuss relationship between the DFT and other Transforms.	**07**
Q.4	**(a)**	Describe IIR Filter design by impulse invariant method.	**07**
	(b)	Draw direct form –I and direct form-II for the given system:	**07**

$$H(z) = \frac{1 + 2z^{-1}}{1 - 1.5z^{-1} + 0.9z^{-2}}.$$

OR

Q.4	**(a)**	Explain filter design by bilinear Transformation method.	**07**
	(b)	Draw cascade structure for the given system:	**07**

$$H(z) = \frac{1 + 2z^{-1} + z^{-2}}{1 - 0.75z^{-1} + 0.125z^{-2}}$$

Q.5	**(a)**	Discuss radix-2 DIF FFT algorithm with suitable example.	**07**
	(b)	Describe Kaiser window in details.	**07**

OR

Q.5 **(a)** Discuss radix-2 DIT FFT algorithm with suitable example. **07**

(b) Explain (1) Rectangular window (2) Hamming window (3) Hanning window with equation. **07**

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