GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– V EXAMINATION – SUMMER 2020

Subject Code: 2150307   **Date:29/10/2020**

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.**

			MARKS
Q.1	**(a)**	Define following signals with proper example: 1. Digital Signal 2. Continuous Time Signal 3. Power Signal	**03**
	(b)	Draw the following signals, if x(n) = {1, 2, 3, 4, 5, 6} ↑ 1. x(-n) 2. x(-n-1) 3. x(n/2) 4. 2x(n)	**04**
	(c)	List out different properties of Z-Transform. Explain any three in detail.	**07**
Q.2	**(a)**	Sketch the following Signals. 1. $\delta(n-3)$ 2. $\delta(n+3)$ 3. $\delta(-n)$ 4. $\delta(-n+2)$	**03**
	(b)	Check y(n)= nx(n-1) is 1. Static or Dynamic 2. Time variant or Time In-variant 3. Linear or Non Linear 4. Causal or Anti Causal	**04**
	(c)	For the system Y (n)-3/4y (n-1) +1/8y (n-2) =x (n) +1/2x (n-1). Derive the direct form I and direct form II structures.	**07**

OR

	(c)	Draw the parallel form realization of following signal y(n) = 5y(n −1) −2y(n −2) + x(n) + 4x(n −1).	**07**
Q.3	**(a)**	What do you mean by correlation? Explain with examples.	**03**
	(b)	Find out convolution of following sequences x(n)= 5nu(n) and h(n)= u(n-5).	**04**
	(c)	Consider a sequence x[n]={1,1,-1,-1,-1,1,1,-1} determine the DFT X[k] of x[n] using the decimation-in-time FFT algorithm.	**07**

OR

Q.3	**(a)**	Obtain the inverse z-transform of the following: $X(z) = \log(1 + a\,z^{-1})$, $|z| > |a|$	**03**
	(b)	Find out the Z-transform of following: $X(n) = a^n u(n)$	**04**
	(c)	Given x(n)={1,2,3,4,4,3,2,1}, find X(k) using Decimation-In-Frequency FFT algorithm.	**07**

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Q.4	(a)	Explain Mapping between S-plane and Z-plane.	03
	(b)	Explain Goertzel algorithm to compute DFT.	04
	(c)	Obtain the lattice filter implementation for the all-pole filter	07

$$H(z) = \frac{1}{1 - 0.2z^{-1} + 0.4z^{-2} + 0.6z^{-3}}$$

OR

Q.4	(a)	What is Equiripple Approximation?	03
	(b)	What is aliasing? Explain various methods to eliminate aliasing effect.	04
	(c)	Find out 8-point DFT of x(n)={1,2,1,2} using Radix -2 DIF-FFT algorithm.	07

Q.5	(a)	List the advantages of digital filter.	03
	(b)	Compare Butterworth and Chebyshev filters.	04
	(c)	Explain IIR filter design by bilinear transformation method.	07

OR

Q.5	(a)	What is "twiddle factor" of DFT?	03
	(b)	What is Gibbs Phenomena?	04
	(c)	Explain how to remove baseline drift in ECG using Digital filters.	07

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