Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (OLD) EXAMINATION – SUMMER 2022

Subject Code:171003 Date:06/06/2022

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)**	Draw and explain the following sequences: i) Unit sample sequence ii) Unit step sequence iii) Unit ramp sequence iv) Sinusoidal sequence and v) Real exponential sequence	**07**
	(b)	List the merits and demerits of Digital signal processing.	**07**
Q.2	**(a)**	Determine if the system described by the following input-output equations are linear or non-linear. i) $y(n) = x(n) + (1 / (x(n-1))$ ii) $y(n) = x^2(n)$	**07**
	(b)	State and prove the following properties of z-transform. i) Time shifting ii) Time reversal iii)Differentiation iv) Scaling in z-domain	**07**
		OR	
	(b)	Explain the principle of operation of analog to digital conversion with a neat diagram.	**07**
Q.3	**(a)**	Find the inverse z-transform of x(z) $x(z) = z^{-1}/(2-3z^{-1}+z^{-2})$ ROC: $z > 1$.	**07**
	(b)	Describe the different types of discrete time signal representation.	**07**
		OR	
Q.3	**(a)**	What is the advantage of radix-2 FFT algorithm in comparison with the classical DFT method?	**07**
	(b)	Explain the design of FIR filters using windows.	**07**
Q.4	**(a)**	Find the z-transform and ROC of the causal sequence. X(n) = {1,0,3,-1,2} ↑	**07**
	(b)	Describe the window sequences generally used and compare their properties	**07**
		OR	
Q.4	**(a)**	What is ROC?State properties of ROC.	**07**
	(b)	Using a rectangular window technique design a lowpass filter with pass band gain of unity,cutoff frequency of 1000 Hz and working at a sampling frequency of 5 kHz. The length of the impulse response should be 7.	**07**
Q.5	**(a)**	Determine the z-transform of $x(n) = \cos(\omega_0 n)u(n)$	**07**
	(b)	Explain any two properties of Discrete Fourier Transform.	**07**
		OR	
Q.5	**(a)**	State and prove any two properties of z-transform.	**07**
	(b)	Write short notes about the applications of DSP.	**07**

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