Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2018

Subject Code:2150307 **Date:07/12/2018**

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.**

			MARKS
Q.1	**(a)**	What is aliasing? Explain various methods to eliminate aliasing effect.	**03**
	(b)	Draw the following signals, if $x(n) = \{1, \underset{\uparrow}{2}, 3, 4, 5, 6\}$ 1. x(-n) 2. x(-n-1) 3. x(n/2) 4. 2x(n)	**04**
	(c)	Find out 8-point DFT of x(n)={1,2,1,2} using Radix -2 DIF-FFT algorithm.	**07**
Q.2	**(a)**	Define following signal: 1. Multichannel Signal 2. Continuous Time Signal 3. Power Signal	**03**
	(b)	Check y(n)= x(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)	Draw the parallel form realization of following signal $y(n) = 3y(n-1) - 2y(n-2) + x(n) + 4x(n-1).$ **OR**	**07**
	(c)	Draw the Cascade form realization of $H(z) = \frac{1 + 3Z^{-1} + 2Z^{-2}}{1 + 7Z^{-1} + 12Z^{-2}}$	**07**
Q.3	**(a)**	Prove Differentiation property of Z-Transform.	**03**
	(b)	Find out convolution of following sequences $x(n)= 5^n u(n)$ and $h(n)= u(n-5)$.	**04**
	(c)	Write a short not on Bilinear Transformation technique of IIR Filter.	**07**

OR

Q.3 **(a)** Find out Cross Correlation of following sequences **03**

x(n)=$\{1, \underset{\uparrow}{2}, 3, 4\}$ and y(n)=$\{-1, \underset{\uparrow}{2}, 0, 1\}$

(b) Find out Z-transform and Plot ROC of **04**

$$x(n)=0.5^n(u(n-1)-u(n-5))$$

(c) Use Impulse invariance method and transform following analog filter into digital filters. **07**

$$1)\ H_a(s)=\frac{(s+5)}{(s+5)^2+9}$$

$$2)\ H_b(s)=\frac{1}{(s+1)(s+3)}$$

Q.4 **(a)** Enlist various properties of Discrete Fourier Series. **03**

(b) Find out IDFT of X(k)={1,2+j,1,2-j}. **04**

(c) What is Transposed Structure? Explain how to find transposed structure with example. **07**

OR

Q.4 **(a)** Prove: "If x(n) is real valued sequence then X(N-k)=X(k)=X*(k)". **03**

(b) Find out circular convolution of x(n)={1,2,3,4} and h(n)={4,3,2,1}. **04**

(c) Determine the filter coefficients $h_d(n)$ for the desired frequency response of a low pass filter given by **07**

$$H_d(e^{jw})=\begin{cases} e^{-j5w} & for\ \frac{-\pi}{4}\le w\le\frac{\pi}{4} \\ 0 & for\ \frac{\pi}{4}\le|w|\le\pi \end{cases}$$

Use rectangular window of length 5

$$w(n)=\begin{cases}1 & for\ 0\le w\le 4\\ 0 & elsewhere\end{cases}$$

Determine h(n) also.

Q.5 **(a)** Write a short not on Linear Phase Response of FIR filter. **03**

(b) Enlist any four Windowing methods for FIR filter design. Write their equations and draw the Window Shapes. **04**

(c) Explain how to remove baseline drift in ECG using Digital filters. **07**

OR

Q.5 **(a)** Compare IIR and FIR Filters. **03**

(b) Write a short note on Finite word length effect in digital filters. **04**

(c) Explain how to analyze heart variability. **07**

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