Seat No.:_____     Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY
### BE- SEMESTER–V (NEW) EXAMINATION – WINTER 2020

**Subject Code:3150310**                                   **Date:01/02/2021**

**Subject Name:Biomedical Signals and Systems**

**Time:10:30 AM TO 12:30 PM**                         **Total Marks: 56**

**Instructions:**
1. Attempt any FOUR questions out of EIGHT questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

|     |     |     | Marks |
|-----|-----|-----|-------|
| **Q.1** | **(a)** | Draw various discrete time standard test signal. | **03** |
| | **(b)** | Define System. Classify various types of systems. | **04** |
| | **(c)** | 1. What is the nyquist criteria for biomedical system? Explain it with example. | **03** |
| | | 2. Explain any two properties of DFT. | **04** |
| **Q.2** | **(a)** | Obtain DFT of delayed unit impulse input. | **03** |
| | **(b)** | Explain cyclic property of Twiddle Factor | **04** |
| | **(c)** | Use Circular convolution method to derive linear convolution of following sequences. $$x(n) = \{1,1,1\}\ with\ h(n) = \{0,1,2,2,1\}$$ | **07** |
| **Q.3** | **(a)** | A biomedical signal is described by following equation. Derive its Auto Correlation. $$y(n) = \delta(n) + \delta(n-1) + \delta(n+1)$$ | **03** |
| | **(b)** | Explain how you can represent a discrete time signal as weighted impulses. | **04** |
| | **(c)** | Explain commutative and associative property of Linear Convolution with derivation. | **07** |
| **Q.4** | **(a)** | Explain multiplication method of Linear convolution. | **03** |
| | **(b)** | Check whether following systems are Linear or not? <br> 1. $y(n) = sgn[x(n)]$ <br> 2. $y(n) = Trunc[x(n)]]$ | **04** |
| | **(c)** | Write short note on homogeneous solution of LCCDE equation. | **07** |
| **Q.5** | **(a)** | Derive Z-Transform of following and also comment on ROC. $$x(n) = \left\{ \begin{matrix} -2 & 3 & 5 & 9 & 0 & -6 & 4 \\ & & & \uparrow & & & \end{matrix} \right\}$$ | **03** |
| | **(b)** | Draw the Pole –Zero plot and Unit impulse response of following sequence. $$h(n) = 2^n u(n)$$ | **04** |
| | **(c)** | Define ROC. What is its significance? Enlist any five properties of ROC. | **07** |
| **Q.6** | **(a)** | Derive inverse Z-transform of following equation. $$X(Z) = 4Z^{-3} - 6Z^{-2} + 9 + 5Z + 3Z^2 - 2Z^3$$ | **03** |
| | **(b)** | Derive the unit step response of following signal. $$h(n) = 5^n u(n)$$ | **04** |
| | **(c)** | Explain Differentiation and Scaling properties of Z-Transform with derivation. | **07** |

1

**Q.7** **(a)** Write short note on Parallel realization of IIR structures. **03**

**(b)** Define following **04**

1. IIR System
2. FIR System
3. Recursive system
4. Canonical Structure

**(c)** Draw the cascade and parallel realization of following system **07**

$$H(z) = \frac{(z + 1)}{z^2 + 5z + 6}$$

**Q.8** **(a)** Realize the following FIR system using Direct Form method **03**

$$H(z) = 1 + 2z^{-1} + 3z^{-2} + 4z^{-3}$$

**(b)** Realize the following FIR system using cascade Form method **04**

$$H(z) = 1 + 5z^{-1} + 6z^{-2}$$

**(c)** Write a short note on Frequency Sampling structure of FIR system. **07**