

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – SUMMER 2023****Subject Code:3160313****Date:12-07-2023****Subject Name:Biomedical Signal Analysis****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.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) Explain the purpose or functions of digital filters.	03
	(b) Graphically, draw the flow chart giving the steps for designing the filters.	04
	(c) Explain in detail Impulse Invariant method of designing filter. Describe the relationship of s plane and z plane for impulse invariant method.	07
Q.2	(a) What are non-stationary processes or signals?	03
	(b) State the characteristic comparisons of FIR and IIR filters.	04
	(c) Write a note on random noise. Explain in detail its characteristics with necessary equations.	07
OR		
	(c) Explain in detail Least Mean Squared (LMS) algorithm with an example.	07
Q.3	(a) Describe event related potential and its analysis.	03
	(b) Discuss the application of EEG for assessment of Anesthesia.	04
	(c) Describe in detail Pan Tompkins algorithm for QRS detection in ECG waveform.	07
OR		
Q.3	(a) Write a note on Heart Sound.	03
	(b) Explain changes in ECG waveform under cardiovascular diseases conditions.	04
	(c) Explain in detail coherence analysis of EEG channels.	07
Q.4	(a) Explain in brief about Mexican hat mother wavelet.	03

- (b) Describe derivative based method of QRS detection in ECG with example waveforms and necessary equations. **04**
- (c) Write a note on least squared system design. Give a design example. **07**

OR

- Q.4** (a) Explain the algorithm for detection of P wave in ECG waveform. **03**
- (b) How does template matching for EEG spike and wave detection work? Explain with waveform example. **04**
- (c) What is the purpose of wavelet transformation? Explain one dimensional discrete wavelet transform. **07**

- Q.5** (a) What is a dicrotic notch in carotid pulse? Explain its correlation with ECG waveform. **03**
- (b) Explain the basic concept of moving average filters. **04**
- (c) Explain in detail direct decent and RLS algorithm. **07**

OR

- Q.5** (a) What is an adaptive signal processing? Explain with block diagram. **03**
- (b) Explain in detail detection of EEG rhythms. **04**
- (c) Write and explain design steps for linear phase FIR filters. **07**
