Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VII (New) EXAMINATION – WINTER 2019

Subject Code: 2171102 **Date: 05/12/2019**

Subject Name: Biomedical Instrumentation

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.**

Q. 1	**(a)**	Define the terms: Action Potential and Resting Potential.	**03**
	(b)	With neat figures, explain the depolarization and repolarization process.	**04**
	(c)	Draw and thoroughly explain the generalized medical instrumentation system.	**07**
Q. 2	**(a)**	What is an electrode? With the help of neat figures, explain needle electrodes.	**03**
	(b)	Explain in detail the micro-electrodes.	**04**
	(c)	Explain the following terms with neat figures: Hysteresis, Response time, Sensitivity, Precision	**07**
		OR	
	(c)	Explain the signal processing tactics for improved sensing.	**07**
Q. 3	**(a)**	Explain various noise reduction strategies.	**03**
	(b)	What is an instrumentation amplifier? State its utilities and applications.	**04**
	(c)	With the help of neat figure, explain the human heart functioning.	**07**
		OR	
Q. 3	**(a)**	What is a biopotential? State various types of biopotentials available from the human body.	**03**
	(b)	Draw and explain the ECG amplifier with right-leg and shield drive.	**04**
	(c)	With the help of neat figure, explain the ECG machine mechanism.	**07**
Q. 4	**(a)**	Describe the basic approaches for protection against shock.	**03**
	(b)	With a neat figure, explain the structure of a neuron.	**04**
	(c)	With the help of neat figures, explain the 12-lead system used in ECG measurement.	**07**
		OR	
Q. 4	**(a)**	Explain the organization of the nervous system.	**03**
	(b)	Discuss physiological effects of electricity and important susceptibility parameters.	**04**
	(c)	Explain the 10-20 system for EEG recording with neat figures.	**07**

Q. 5	**(a)**	An EEG system processes a 5 μV signal in the presence of a 100 μV random noise. Calculate the unprocessed SNR, the processed SNR for 1000 repetitions of the signal and the processing gain.	**03**
	(b)	Draw and explain various EEG rhythms.	**04**
	(c)	Draw and explain an EEG telemetry system block diagram.	**07**

OR

Q. 5	**(a)**	For a typical EEG preamplifier (instrumentation amplifier), R3= R5= 100 KΩ, R4= 4 KΩ, R6= 10 KΩ and R7= 100 KΩ. Calculate the output voltage for the differential EEG input signal of 100 μV_{p-p}.	**03**
	(b)	Briefly explain the block diagram of an eight-channel EEG recording system.	**04**
	(c)	Draw and explain the block diagram of a visual and auditory evoked potential system.	**07**

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