Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER–II EXAMINATION – SUMMER 2015

Subject Code: 2725408 **Date: 01/06/2015**

Subject Name: Biomedical Instrumentation and 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.**

Q.1	**(a)**	Draw the block diagram of a man-instrument system. Explain each block with its significance.	**07**
	(b)	Draw and explain following biomedical signals with their diagnostic significance: EMG, ECG, EEG	**07**
Q.2	**(a)**	Explain the working of human cardiovascular system with the help of neat block diagram.	**07**
	(b)	Which are the sources of artifacts encountered in biomedical instruments/ signals? Briefly discuss the necessary techniques to remove these artifacts.	**07**
		OR	
	(b)	With neat sketches explain the various ECG intervals alongwith their physiological significance. Draw and explain various abnormal ECG waves.	**07**
Q.3	**(a)**	Sketch the model of a biomedical electrode and explain the same. Explain various skin surface electrodes.	**07**
	(b)	Enlist various types of sensors and transducers used for recording the biopotentials. State and explain their performance characteristics.	**07**
		OR	
Q.3	**(a)**	Describe the instrumentation used for measuring blood pressure and heart sounds.	**07**
	(b)	What is the necessity of pacemakers and defibrillators? Explain the working principle of defibrillators with necessary figures.	**07**
Q.4	**(a)**	Consider the following transfer function of a filter:	**07**

$$H(z) = \frac{1}{1 - 2\cos\omega_0 z^{-1} + z^{-2}}$$

Which type of filter does it represent? State the application of this filter for an

ECG signal.

	(b)	With neat sketches explain the EEG recording system. Discuss the applications of EEG recording and measurement.	**07**

OR

Q.4	**(a)**	Draw and explain the block diagram of an EEG machine. Design the circuits of necessary band-pass filters for alpha waves and beta waves.	**07**
	(b)	Enlist the techniques for removing baseline wander from an ECG signal. Describe any one in detail.	**07**
Q.5	**(a)**	Explain the principle of radiation. Draw and explain the block diagram of an x-ray machine.	**07**
	(b)	Explain the operating principle of Ultrasound imaging.	**07**

OR

Q.5	**(a)**	Explain the working principle of magnetic resonance imaging (MRI) and describe the working of an MRI machine.	**07**
	(b)	Describe the principle of computed tomography (CT) scanning and state the applications of CT imaging.	**07**

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