Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III(New) EXAMINATION – SUMMER 2016

Subject Code:2130303 Date:27/05/2016

Subject Name:Bioelectric Potential and Measurement Techniques

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 Select the correct answer from multiple choice questions. 14

1 The bundle of muscle fibers in a muscle supplied by a single motor nerve fiber is called a

A Motor unit **B** Purkinje fiber system
C Bundle of His **D** Muscle spindle

2 How is arterial blood pressure expressed?

A 120/80 mmHg **B** 11/16 KPa
C 80/120 mmHg **D** None of the above

3 What are chemoreceptors?

A Nerve endings sensitive to pressure changes **B** Hormones increasing heart rate
C Hormones causing sodium and water loss from the kidney **D** Nerve endings involved in control of respiration

4 Average body temperature is

A 98°C **B** 68°C
C 47°C **D** 37°C

5 Arrhythmia can be diagnosed by

A EEG **B** Phono cardiography
C Vector cardiogram **D** ECG

6 Stokes attacks can be successfully treated with a

A Defibrillator **B** Nerve stimulator
C Pacemaker **D** Artificial heart valve

7 In ECG, the calibration signal amplitude is

A 1 mV **B** 1 V
C 1 µV **D** 0.5 mV

8 EEG waves include frequency content ranging from

A less than 1 Hz to 50 Hz **B** dc to 2000 Hz
C 10 Hz to 1000 Hz **D** 0.05Hz to 2 kHz

9 The resting potential of the inside of the neuron is about

A 100 µV **B** 1 mV
C -70 mV **D** few mV

10 The frequency of the action potential in the relaxed muscle is

A 20-5000 Hz **B** 60 Hz
C 0 Hz **D** 50 Hz

11 During Myocardial Infarction, one can use

A Pacemaker **B** Heart lung machine
C Nerve stimulator **D** Kidney Machine

12 To produce ventricular contraction with an electric pulse, the minimum energy required is

A 10 mW **B** 10µJ
C 1W **D** 1J

13 To avoid electrode polarisation and bio-potential artifacts, electromagnetic blood flow meters are using

A AC magnetic fields **B** DC magnetic fields
C d.c. current **D** circular magnets

14 The duration of R wave in normal sinus rhythm is

A 45 ms **B** 57 ms
C 112 ms **D** 71 ms

Q.2	**(a)**	Classify various transducers by their applications.	**03**
	(b)	List and define various types of bioelectrical potentials generated from human body.	**04**
	(c)	Illustrate the mechanism of electrical discharge from heart with necessary diagrams.	**07**
		OR	
	(c)	Illustrate the propagation of action potential in nerve fiber with necessary diagrams.	**07**
Q.3	**(a)**	Classify various electrodes by their applications.	**03**
	(b)	Write a short note on applications of defibrillators.	**04**
	(c)	Design and explain a block diagram of EEG measurement device.	**07**
		OR	
Q.3	**(a)**	Discuss basic transduction principal.	**03**
	(b)	Write a short note on applications of cardiac pacemaker.	**04**
	(c)	Illustrate and explain the 10-20 lead system for EEG measurement.	**07**
Q.4	**(a)**	List technical specifications of nerve stimulator.	**03**
	(b)	List and explain the methods to measure heart rate.	**04**
	(c)	Describe the instrumentation diagram of electromyography.	**07**
		OR	
Q.4	**(a)**	Discuss the difference between heart rate and pulse rate.	**03**
	(b)	Discuss the force balance equation with necessary examples.	**04**
	(c)	Can direct measurement of cardiac output be possible? Justify your answer and suggest a measurement technique with appropriate block diagram.	**07**
Q.5	**(a)**	List the elements of intensive care monitoring.	**03**
	(b)	Discuss the measurement techniques of half-cell potential.	**04**
	(c)	Describe the design and applications of functional electrical stimulator.	**07**
		OR	
Q.5	**(a)**	Discuss the pros and cons of continuous monitoring of bioelectrical potentials.	**03**
	(b)	Draw the equivalent circuit diagram for skin-electrode interface.	**04**
	(c)	Describe the design and applications of myoelectric arm.	**07**

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