Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–IV (NEW) EXAMINATION – WINTER 2024

Subject Code:3140311 Date:22-11-2024

Subject Name:Fundamentals of Biopotentials

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.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	Define following terms: (i) Transducer (ii) Sensor (iii) Electrode	**03**
	(b)	Write down following equation along with its appropriate description of each variable/parameter: (i) Nernst Equation (ii) GHK equation	**04**
	(c)	Explain in detail the medical instrumentation system with neat diagram.	**07**
Q.2	**(a)**	Write short note on electrode – electrolyte interface along with necessary chemical reactions.	**03**
	(b)	Give difference between Polarizable and Non Polarizable electrode.	**04**
	(c)	Explain in detail Electrode – skin interface and also mention possible source of noise while measurement of bio potentials.	**07**
		OR	
	(c)	Explain in detail various types of electrodes used for measurement of biopotentials with neat diagram.	**07**
Q.3	**(a)**	Write down the values of standard distribution of Na+, K+ and Cl- ions inside and outside the cell.	**03**
	(b)	Give full form of ENG and also enlist its physiological importance of its measurement.	**04**
	(c)	Explain in detail the lead system of ECG.	**07**
		OR	
Q.3	**(a)**	Explain the term flux measurement in context to ion transport or ion exchange.	**03**
	(b)	Draw and explain various components of standard ECG signal.	**04**
	(c)	Explain in detail the 10 – 20 system for EEG.	**07**
Q.4	**(a)**	Explain briefly the term permeability coefficient.	**03**
	(b)	Explain physiology of Calcium pump.	**04**
	(c)	Explain in detail Na-K ATPase pump and its working in detail with neat diagram.	**07**
		OR	

Q.4	**(a)**	Explain briefly the term diffusion coefficient.	**03**
	(b)	Discuss the calculations of P_{Na} from P_K or P_{Na}/P_K	**04**
	(c)	Explain in detail the circuit analysis of cell membrane with necessary diagram.	**07**
Q.5	**(a)**	Enlist various factors or parameters from heat sink design.	**03**
	(b)	Explain physiological effects of electricity.	**04**
	(c)	Explain in detail the basic approaches towards protection from electrical shock.	**07**

OR

Q.5	**(a)**	Enlist various electrical safety codes/standards.	**03**
	(b)	Explain capacitive and inductive crosstalk.	**04**
	(c)	Explain in detail various macro shock and micro shock hazards.	**07**

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