U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

April 2024 Semester End Main Examinations

Programme: B.E. **Semester: III**
Branch: Medical Electronics Engineering **Duration: 3 hrs.**
Course Code: 22MD3PCBSM **Max Marks: 100**
Course: Biomedical Sensors and Measurements

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	*CO*	*PO*	Marks
1	a)		What do you meant by measurement error ? Explain in detail types of error and sources of error in detail.	CO1	PO1	**10**
	b)		Explain the following Performance characteristics of instruments: i)Static characteristics –Linearity,Accuracy,Precision, Stability ii)Dynamic characteristics –Step response, Time delay lag	CO1	PO2	**10**
			UNIT - II			
2	a)		Discuss any two transducers which is suitable for Physiological pressure measurement in detail.	CO1	PO2	**8**
	b)		Explain the typical ranges of biomedical signals of the following: ECG, EMG, EEG.	CO1	PO2	**4**
	c)		Describe the working of Strain gauge as resistive transducers and explain its types	CO1	PO2	**8**
			UNIT - III			
3	a)		Compare the characteristics of RTD, Thermocouple and thermistors.	CO1	PO2	**12**
	b)		Explain the concept of measurement using the radio pill for core body temperature.	CO1	PO1	**8**
			OR			
4	a)		Explain how the Non-contact techniques are applied for temperature measurements	CO1	PO2	**8**
	b)		Discuss the concept of Zero heat flow for deep tissue temperature measurement with examples.	CO1	PO2	**12**
			UNIT - IV			
5	a)		Explain the Electrode to electrolyte and Electrode–Skin Interface with its equivalent circuit diagram.	CO1	PO2	**10**

		b)	Describe the generation and features of resting membrane potential action potential and also explain the refractory period of a cell with neat a diagram	CO1	PO3	**10**
			OR			
	6	a)	Discuss the different types of ECG lead configuration? And Explain the Einthoven triangle and its relationship with lead configuration.	CO1	PO2	**10**
		b)	Explain in detail about various types of electrodes used for the measurement of bio potential signals.	CO1	PO2	**10**
			UNIT - V			
	7	a)	Discuss the working principle of Electrochemical – CO2 electrode and Zirconia oxygen sensor.	CO1	PO3	**10**
		b)	Explain the main principle of Biosensor and any two types of Biosensors with neat diagram.	CO2	PO1	**10**

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