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

Autonomous Institute Affiliated to VTU

January / February 2025 Semester End Main Examinations

Programme: B.E. **Semester: III**

Branch: Medical Electronics Engineering **Duration: 3 hrs.**

Course Code: 23MD3PCBSM **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)	Explain the static characteristics of a sensor with examples.	CO1	PO1	**04**
	b)	Explain the step responses of zero, first, and second-order systems with examples.	CO1	PO1	**08**
	c)	What are the types of measurement errors? Discuss methods to improve measurement accuracy.	CO1	PO1	**08**
		OR			
2	a)	Discuss the static and dynamic characteristics of sensors in detail.	CO1	PO1	**08**
	b)	How can sensor measurement systems be improved? Discuss in detail.	CO1	PO1	**08**
	c)	Describe the dynamic characteristics of a first-order system.	CO1	PO1	**04**
		UNIT - II			
3	a)	Differentiate between active and passive sensors with examples.	CO2	PO2	**04**
	b)	Explain the theory and applications of resistive strain gauges. Include bridge circuits in your explanation.	CO2	PO2	**08**
	c)	Compare resistive, inductive, and capacitive sensors in terms of working principles and applications.	CO2	PO2	**08**
		OR			
4	a)	Describe the operating principle of an LVDT with a neat diagram.	CO2	PO2	**08**
	b)	What is respiratory inductance plethysmography (RIP), and how is it used?	CO2	PO2	**04**
	c)	Explain the working principle and applications of piezoelectric sensors.	CO2	PO2	**08**

			UNIT - III			
	5	a)	Compare RTDs, thermistors, and thermocouples in terms of principles, characteristics, and materials.	*CO3*	*PO3*	**08**
		b)	Describe the operation of a pulse oximeter using photoelectric sensors.	*CO3*	*PO3*	**08**
		c)	How do photovoltaic sensors work, and what are their applications?	*CO3*	*PO3*	**04**
			OR			
	6	a)	Define RTDs and its working principle, list one material used in their construction.	*CO3*	*PO3*	**04**
		b)	Discuss the role of the AD590 in temperature measurement systems.	*CO3*	*PO3*	**08**
		c)	Explain the principle of fiber optic temperature sensors and their advantages in medical applications.	*CO3*	*PO3*	**08**
			UNIT - IV			
	7	a)	What is an action potential? Explain polarized and depolarized state of a cell with a neat figure.	*CO4*	*PO4*	**06**
		b)	Describe the origin and characteristics of an ECG signal with a neat waveform.	*CO4*	*PO4*	**06**
		c)	Discuss the electrode-tissue interface and its implications on signal quality.	*CO4*	*PO4*	**08**
			OR			
	8	a)	Describe the generation, characteristics, and clinical applications of EEG signals.	*CO4*	*PO4*	**08**
		b)	Explain the characteristics and advantages of Ag-AgCl electrodes.	*CO4*	*PO4*	**04**
		c)	Describe the 10-20 system in detail, including its advantages in EEG recordings.	*CO4*	*PO4*	**08**
			UNIT - V			
	9	a)	Describe the principle, construction, and working of ion-selective field-effect transistors (ISFETs).	*CO5*	*PO9*	**08**
		b)	Explain the working principle of a Quartz Crystal Microbalance (QCM)-based immunosensor.	*CO5*	*PO9*	**04**
		c)	Discuss the concept, components, and properties of biosensors.	*CO5*	*PO9*	**08**
			OR			
	10	a)	Explain the principle, construction, and applications of immunosensors.	*CO5*	*PO9*	**08**
		b)	Describe the enzyme-based biosensor and its applications.	*CO5*	*PO9*	**04**
		c)	Describe the Clark electrode and its role in glucose detection.	*CO5*	*PO9*	**08**

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