U.S.N.										

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

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: IV**

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

Course Code: 19ML4PCDIN **Max Marks: 100**

Course: Diagnostic Instruments

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)		Illustrate the origin and propagation of biopotentials in the human body. Describe the various interfaces involved when using electrodes for biopotential measurement, focusing on the electrode-electrolyte and electrode-skin interfaces.	*CO1*	*PO2*	**10**
	b)		Differentiate between polarizable and non-polarizable electrodes, providing examples of each and highlighting why non-polarizable electrodes are generally preferred for biopotential measurements.	*CO3*	*PO2*	**10**
			OR			
2	a)		Describe any 3 types of electrodes used for biopotential measurements.	*CO3*	*PO2*	**10**
	b)		Discuss the significance of impedance in biopotential measurements. Explain how high electrode impedance can affect the quality of recorded signals, leading to problems like noise and motion artifacts.	*CO3*	*PO2*	**10**
			UNIT - II			
3	a)		Discuss the general characteristics of biopotentials, including their typical frequency and amplitude ranges.	*CO3*	*PO2*	**10**
	b)		Describe the standard 12-lead ECG system and the concept of Einthoven's triangle. Explain how the leads are derived and their significance in clinical diagnosis.	*CO3*	*PO2*	**10**
			OR			
4	a)		Explain the 10-20 electrode system for EEG recordings. Describe the principles of unipolar, bipolar, and average reference electrode configurations used in EEG.	*CO3*	*PO2*	**10**
	b)		Compare and contrast the electrode configurations used for Electrocardiogram (ECG) and Electromyogram (EMG) recordings.	*CO3*	*PO2*	**10**

			UNIT - III			
	5	a)	Compare and contrast single-ended and differential bio-amplifiers, detailing their operational principles, advantages, and disadvantages.	*CO3*	*PO2*	**10**
		b)	Describe the role of isolation amplifiers in biomedical instrumentation, distinguishing between transformer isolation and optical isolation methods.	*CO3*	*PO2*	**10**
			OR			
	6	a)	What is a chopper amplifier and why is it used in biomedical signal acquisition?	*CO3*	*PO2*	**10**
		b)	Discuss the significance of bandpass filtering in bio-amplifiers. Explain how different frequency ranges are typically selected for ECG, EEG, and EMG, and the rationale behind these choices.	*CO3*	*PO2*	**10**
			UNIT - IV			
	7	a)	Describe the methods for measuring respiration rate, and pulse rate. For each parameter, explain the underlying physiological principle and the common sensors used.	*CO3*	*PO2*	**10**
		b)	Explain the indirect methods for blood pressure measurement, focusing on the auscultatory and oscillometric techniques.	*CO3*	*PO2*	**10**
			OR			
	8	a)	Describe the components of an electronic manometer for direct blood pressure measurement and explain the function of systolic, diastolic, and mean detector circuits in BP monitoring.	*CO3*	*PO2*	**10**
		b)	Explain in brief the principles behind the indicator dilution, thermal dilution, and electromagnetic blood flow measurement techniques.	*CO3*	*PO2*	**10**
			UNIT - V			
	9	a)	Describe the working principles of pH, pO2, and pCO2 sensors commonly used in blood gas analysers.	*CO3*	*PO2*	**10**
		b)	Explain the operational principle of Ion-Sensitive Field Effect Transistors (ISFETs) and Immunologically Sensitive Field Effect Transistors (IMFETs).	*CO3*	*PO2*	**10**
			OR			
	10	a)	Describe the principles and applications of the following biochemical measurement techniques: i) Flame Photometer ii) Spectrophotometer.	*CO3*	*PO2*	**10**
		b)	Provide a simplified schematic description of an auto analyser and discuss its advantages in clinical laboratory automation.	*CO3*	*PO2*	**10**

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