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: III**

Branch: Electronics and Instrumentation Engineering **Duration: 3 hrs.**

Course Code: 23EI3PCSMT / 22EI3PCSMT **Max Marks: 100**

Course: Sensors and Measurements Techniques

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

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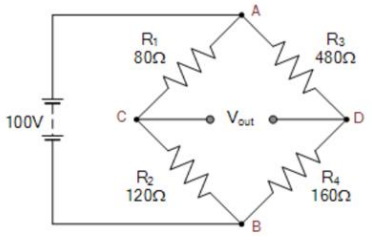
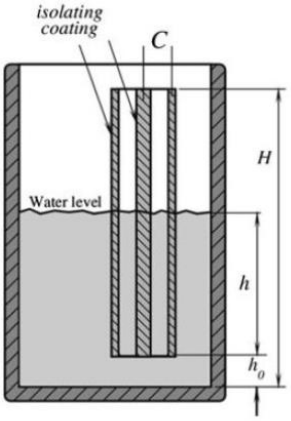
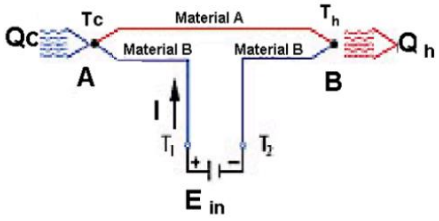
Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		MODULE - I	CO	PO	Marks
1	a)	Define the following static characteristics of sensor: i) Linearity and non-linearity ii) Hysteresis iii) Repeatability and reproducibility iv) Resolution and threshold	CO1	PO1	**08**
	b)	Write the Maxwell's bridge and derive an expression for its balanced condition.	CO2	PO1	**08**
	c)	Given expected voltage value across a resistor is 80V. The measurement is 79V. Calculate, i. The absolute error ii. The % of error iii. The relative accuracy iv. The % of accuracy	CO3	PO2	**04**
		OR			
2	a)	The unbalanced Wheatstone Bridge is constructed as shown in figure1. Calculate the output voltage across points C and D and the value of resistor R4 required to balance the bridge circuit.  figure1	CO3	PO2	**06**
	b)	Two technicians measure the diameter of a circular object under different conditions (such as different equipment or environmental factors). Technician A measures the object and	CO3	PO2	**04**

			records the following values (in cm): 10.2, 10.3, 10.2, 10.4, and 10.3. Technician B measures the same object and records: 10.1, 10.3, 10.2, 10.3, and 10.4. Calculate i) Mean for each technician's measurements. ii) Reproducibility			
		c)	Define measurement system and explain its various elements with a neat block diagram.	*CO1*	*PO1*	**10**
			MODULE - II			
	3	a)	Identify and explain the sensing principle depicted in figure 2  figure 2	*CO2*	*PO2*	**06**
		b)	Discuss the construction and working of piezoelectric crystal.	*CO2*	*PO1*	**06**
		c)	Discuss the working principle of Hall effect sensor.	*CO2*	*PO1*	**08**
			OR			
	4	a)	Identify and explain the phenomenon depicted in figure 3  Figure.3	*CO2*	*PO2*	**05**
		b)	Discuss the various ways of thermal energy transfer from one object to another object.	*CO2*	*PO1*	**10**
		c)	Explain the construction and working principle of inductive based proximity sensor and its application.	*CO2*	*PO1*	**05**
			MODULE - III			
	5	a)	Explain the construction and working principle of fibre optic microphone.	*CO2*	*PO1*	**10**
		b)	Discuss the construction and working principle of Scintillation detector.	*CO2*	*PO1*	**10**

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			OR			
	6	a)	Illustrate how thermal conductivity of gas can be used for measurement of humidity.	*CO2*	*PO1*	**10**
		b)	What are photoresistors, discuss its construction and working principle.	*CO2*	*PO1*	**10**
			MODULE - IV			
	7	a)	What is self heating in thermistor and its implications.	*CO1*	*PO1*	**05**
		b)	Explain the construction, operating principle, and resistance equation approximation of an RTD (Resistance Temperature Detector).	*CO1*	*PO1*	**10**
		c)	What are the ways to increase the coupling between object and temperature sensors.	*CO2*	*PO1*	**05**
			OR			
	8	a)	Explain the laws of thermocouples that establish the fundamental rules for proper connection of the thermocouples.	*CO1*	*PO1*	**10**
		b)	Explain how fibre optic sensor can be used for temperature measurement using interferometric method.	*CO2*	*PO1*	**10**
			MODULE - V			
	9	a)	Discuss four wire method of measurement of resistance.	*CO5*	*PO1*	**05**
		b)	Discuss the need and types of drivers.	*CO5*	*PO1*	**05**
		c)	Write a note on inherent noise and its types with relevant equations.	*CO5*	*PO1*	**10**
			OR			
	10	a)	Explain the various types of signal conditioning circuits.	*CO5*	*PO1*	**08**
		b)	What is the need of magnetic shield?	*CO5*	*PO1*	**06**
		c)	Discuss two wire transmission system.	*CO5*	*PO1*	**06**

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