CBCS SCHEME

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BEC306B

Third Semester B.E./B.Tech. Degree Examination, June/July 2025
Sensors and Instrumentation

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain with neat diagram functions and data flow in a measurement and control system.	08	L2	CO1
	b.	Explain the classification of sensors with examples.	04	L2	CO1
	c.	Explain primary pressure sensors with neat diagrams.	08	L2	CO1
		OR			
Q.2	a.	Explain microsensor technology using (i) Thick-film technology (ii) Thin film technology (iii) Micromaching technologies.	08	L2	CO1
	b.	Explain with neat diagrams, the different types of ferro magnetic materials.	08	L2	CO1
	c.	Briefly explain acceleration and inclination sensors.	04	L2	CO1
		Module – 2			
Q.3	a.	Explain different kinds of thermocouple junctions and their sheaths.	08	L2	CO2
	b.	Briefly explain (i) Parameters used in piezoelectric equations. (ii) Equivalent circuit for a piezoelectric sensors.	04	L2	CO2
	c.	Explain with diagram photoelectric effect in PN junction.	08	L2	CO2
		OR			
Q.4	a.	Explain how electrochemical sensor used in measurement arrangement using an ionselective electrode (ISE).	06	L2	CO2
	b.	Derive expression for current responsivity of pyroelectric effect.	08	L2	CO2
	c.	Explain with diagrams several forms of applying the SeeBeck effect in a thermocouple.	06	L2	CO2
		Module – 3			
Q.5	a.	Define the following terms applied to an electronic instruments: (i) Accuracy (ii) Resolution (iii) Precision (iv) Sensitivity.	06	L1	CO3
	b.	The expected value of the voltage across a resistor is 80 V. However the measurement gives a value of 79 V. Calcualte (i) absolute error, (ii) % error (iii) relative accuracy and (iv) % of accuracy.	08	L3	CO3
	c.	Briefly explain muiltirange voltmeter with neat diagram.	06	L2	CO3

		OR			
Q.6	**a.**	A 1 mA meter movement having an internal resistance of 100 Ω is used to convert into a multirange Ammeter having the range 0 - 10 mA, 0 - 20 mA and 0 - 50 mA. Determine the value of the shunt resistance required.	**06**	**L3**	**CO3**
	b.	Explain the working principle of successive approximation digital voltmeter, with help of block diagram.	**08**	**L2**	**CO3**
	c.	Explain with neat block diagram of a dual slope type DVM.	**06**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Explain with neat block diagram of digital frequency meter.	**08**	**L2**	**CO4**
	b.	Describe the working of a function generator with the help of block diagram.	**06**	**L2**	**CO4**
	c.	An inductance comparison bridge is used to measure inductive impedance at a frequency of 5 KHz. The bridge constants at balance are L_3 = 10 mH, R_1 = 10 KΩ , R_2 = 40 KΩ, R_3 = 100 KΩ. Find the equivalent circuit of the unknown impedance.	**06**	**L3**	**CO4**
		OR			
Q.8	**a.**	What is Bridge? Derive an balance equation for Wheatstone bridge.	**07**	**L2**	**CO4**
	b.	A capacitance comparison bridge is used to measure a capacitive impedance at a frequency of 2 KHz. The bridge constants at balance are C_3 = 100 μF, R_1 = 10 KΩ, R_2 = 50 KΩ and R_3 = 100 KΩ. Find the equivalent circuit of the unknown impedance.	**05**	**L2**	**CO4**
	c.	Derive an expression for frequency of the wein bridge circuit.	**08**	**L2**	**CO1**
		Module – 5			
Q.9	**a.**	Explain the construction and working of bonded resistance wire strain gauge and semiconductor strain gauge.	**10**	**L2**	**CO5**
	b.	With necessary sketches, explain the construction and working principle of LVDT.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain with neat diagram resistance thermometer.	**06**	**L2**	**CO5**
	b.	Briefly explain temperature indicators using thermister.	**04**	**L2**	**CO5**
	c.	Describe the working of analog weight scale with neat diagram.	**10**	**L2**	**CO5**

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