Reg. No.															

Question Paper Code	13969

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Third Semester

Electronics and Instrumentation Engineering

24EIPC301 - ELECTRICAL MEASUREMENTS AND SENSORS

Regulations - 2024

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	A Permanent Magnet Moving Coil (PMMC) instrument is fundamentally suitable only for measuring (a) High frequency AC (b) Low frequency AC (c) DC (d) Pulsating DC	1	K1	CO1
2.	The Kelvin double bridge is specifically designed to eliminate the error caused by (a) Temperature variations (b) Skin effect (c) Resistance of leads and contacts (d) Thermal EMF	1	K1	CO1
3.	Creeping error in an energy meter is caused by (a) Overload (b) Overvoltage (c) Friction and stray magnetic fields (d) Low voltage	1	K1	CO2
4.	A smart energy meter differs from a conventional meter mainly in (a) Appearance (b) Remote monitoring and communication features (c) Material used (d) Display type only	1	K1	CO2
5.	DC potentiometer works on the principle of (a) Comparison (b) Deflection (c) Induction (d) Null balance	1	K1	CO3
6.	The digital LCR meter measures (a) Inductance only (b) Capacitance only (c) Resistance only (d) All L, C, and R	1	K1	CO3
7.	The error caused due to non-linearity in a measuring system is called (a) Gross error (b) Random error (c) Systematic error (d) Static error	1	K1	CO4
8.	An active transducer is distinct from a passive transducer because it: (a) Requires high current to operate (b) Generates its own electrical output without an external power source (c) Is generally more accurate (d) Uses the change in resistance for measurement	1	K1	CO4
9.	The time constant of a first-order system determines its (a) Sensitivity (b) Speed of response (c) Resolution (d) Accuracy	1	K1	CO5
10.	An LVDT has a sensitivity of 20 mV/mm. If the core displacement changes by 0.5 mm, the change in output voltage will be: (a) 40 mV (b) 20.5 mV (c) 10 mV (d) 0.01 mV	1	K2	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	Why PMMC Ammeters are the most widely used instrument?	2	K1	CO1
12.	Illustrate the types of analog ammeter used for instrumentation.	2	K2	CO1
13.	State the principle of operation of an electrodynamics type wattmeter.	2	K2	CO2
14.	Outline the importance of calibration in wattmeter and energy meter testing.	2	K2	CO2
15.	Explain the use of a wave analyzer.	2	K2	CO3
16.	Write the difference between frequency and time period measurement.	2	K2	CO3
17.	Explain static calibration.	2	K2	CO4
18.	Explain the term sensitivity of a transducer.	2	K2	CO4
19.	Distinguish between sensitivity and resolution.	2	K2	CO5

20.	Draw and interpret the response of a first-order system to a step input.		2	K2	CO5
21.	Define gauge factor and its significance.		2	K1	CO6
22.	Mention any two features of proximity sensors.		2	K1	CO6

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Analyze the bridge and derive the condition for bridge balance the circuit diagram for Kelvin Double Bridge, explaining how the design eliminates the effect of lead and contact resistances in low resistance measurement.	11	K3	CO1
		OR			
	b)	Draw the circuit diagram of the Anderson Bridge used for measuring self-inductance. Analyze the bridge balance equations and explain why this bridge is considered more versatile than the Maxwell-Wein Bridge, despite being more complex.	11	K3	CO1
24.	a)	Explain the construction and working of induction type single phase energy meter.	11	K2	CO2
		OR			
	b) (i)	Describe the principle and operation of phantom loading used in testing wattmeter.	5	K2	CO2
	(ii)	Give a detailed comparison between direct loading and phantom loading.	6	K2	CO2
25.	a)	Draw the functional block diagram of a Dual-Slope Integrating Digital Voltmeter (DVM). Analyze how this technique inherently rejects the noise and hum (power line frequency) present in the input signal.	11	K3	CO3
		OR			
	b) (i)	Make use of standard inputs and discuss the calibration process for a digital voltmeter.	5	K3	CO3
	(ii)	Identify the various digital techniques to improve accuracy in measurement.	6	K3	CO3
26.	a) (i)	Organize in order of importance the differences between static and dynamic characteristics of measuring instruments.	6	K3	CO4
	(ii)	Choose the factors that affect accuracy of measurement during calibration and explain in detail.	5	K3	CO4
		OR			
	b)	Discuss the necessity of Error Analysis in instrumentation. Evaluate the use of Statistical Methods (like standard deviation and variance) in characterizing the overall performance and uncertainty of a batch of similar transducers.	11	K3	CO4
27.	a)	A transducer is modeled as a First-Order System with time constant. Analyze and derive the expressions for the transient error and steady-state error when this system is subjected to a ramp input.	11	K4	CO5
		OR			
	b)	With neat sketches, explain the response of a second-order system to a ramp input. Derive the relevant time-domain expression.	11	K4	CO5
28.	a) (i)	Make use of the characteristics of a Linear Variable Differential Transformer and explain the construction and principle of operation of it.	7	K3	CO6
	(ii)	Identify how it is practically used for measuring displacement.	4	K3	CO6
		OR			
	b) (i)	Apply the concept of inductance and capacitance to detail the principle and working of proximity sensors**.**	7	K3	CO6
	(ii)	Compare inductive, capacitive, and ultrasonic proximity sensors**.**	4	K3	CO6