C **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code: U3503

B.E. / B.Tech. DEGREE EXAMINATION, APRIL / MAY 2025

Professional Elective

Electrical and Electronics Engineering

21EEV503-SENSING TECHNIQUES AND SENSOR SYSTEMS

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. The error which is caused by unpredictable variations in the sensor's output. CO1-U

   (a) Random Error (b) Systematic Error (c) Gross Error (d) Static Error

2. The most commonly used sensor to measure strain is ___. CO1-U

   (a) Piezoelectric Sensor (b) Strain Gauge (c) Load Cell (d) Vacuum Sensor

3. Residual voltage is produced in ____. CO1-U

   (a) Potentiometric Sensor (b) Capacitive Sensor (c) LVDT (d) FMagnetic Sensor

4. The fact that distinguishes optical gyroscopes from mechanical gyroscopes is ___. CO1-U

   (a) Faster response time (b)) Higher sensitivity

   (c) No moving parts (d) Lower cost

5. Type of signal conditioning circuit that is often used for thermoresistive sensors is ___. CO1-U

   (a) Wheatstone Bridge (b) Schmitt Trigger

   (c) Low-Pass Filter (d) Op-Amp Circuit

PART – B (5 x 3= 15 Marks)

6. Discuss the key electronic properties of semiconductors that make them suitable for sensors. CO1-U

7. Apply the concept of a torque sensor in an automobile engine system and show its significance in vehicle performance. CO2-App

8.		Modify the design of a basic signal conditioning circuit for an ultrasonic sensor used in level measurement and illustrate its key functional blocks.	CO2-App	
9.		Experiment with piezoresistive and piezoelectric accelerometers to determine their advantages in dynamic applications and categorize their best-use scenarios.	CO2-App	
10.		Explain how an ultrasonic flow sensor determines the liquid flow rate in a pipe system and analyze the key factors affecting its performance.	CO1-U	

PART – C (5 x 16= 80 Marks)

11.	(a)	Explain the classification of sensors based on their working principles and applications. Provide suitable examples and include a table or graphical representation to support your explanation.	CO1-U	(16)
		Or		
	(b)	Describe the role of CCDs (Charge-Coupled Devices) in imaging systems. Include a system-level block diagram and explain their applications in scientific and consumer technologies.	CO1-U	(16)
12.	(a)	Develop a signal conditioning circuit that can be used with a strain gauge-based force measurement set up. Describe how it amplifies the strain measurement output.	CO2-App	(16)
		Or		
	(b)	Apply your understanding of capacitive pressure sensors to explain their operation and illustrate how they are used for pressure measurement with a suitable example application and a block diagram.	CO2-App	(16)
13.	(a)	Analyze the working principles of potentiometric and capacitive sensors, outline their key characteristics, and classify real-world applications for both types.	CO3-Ana	(16)
		Or		
	(b)	Break down the working principles of inductive and magnetic sensors, categorize their applications in position and displacement measurement, and illustrate their functionality with necessary diagrams.	CO3-Ana	(16)

14.	(a)	Examine the characteristics and working of a capacitive accelerometer, diagram its structure using a block diagram, and analyze its uses.	CO4-Ana	(16)
		Or		
	(b)	Analyze the working of a monolithic gyroscope and explain its applications in an engineering system with a block diagram.	CO4-Ana	(16)
15.	(a)	Apply the principles of a thermocouple temperature sensor to real-world scenarios, illustrate its structure with a labeled circuit diagram, and show its practical applications.	CO5-App	(16)
		Or		
	(b)	Apply the operating principle of electromagnetic flow sensors to industrial setups, illustrate their working with a labeled block diagram, and experiment with their use in different conditions.	CO5-App	(16)