



QUESTION BANK

Course Code and Name : OMR353- SENSORS
Year / Semester : IV/ 07
Department : ECE
Course Type : T
Credits : 3
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Course Outcome: (List the Course Outcomes of the Course)

CO1 : Understand various sensor effects, sensor characteristics, signal types, calibration methods and obtain transfer function and empirical relation of sensors. They can also analyze the sensor response.

CO2 : Analyze and select suitable sensor for displacement, proximity and range measurement.

CO3 : Analyze and select suitable sensor for force, magnetic field, speed, position and direction measurement.

CO4 : Analyze and Select suitable sensor for light detection, pressure and temperature measurement and also familiar with other miniaturized smart sensors.

CO5 : Select and design suitable signal conditioning circuit with proper compensation and linearizing element based on sensor output signal.

UNIT- I – SENSOR CLASSIFICATION, CHARACTERISTICS AND SIGNAL TYPES

S.No	PART – A (2 Marks)	BT Level	Course Outcome	Marks Allotted
1.	What is meant by sensors?	BTL1	[CO1]	[2]
2.	What is the difference between accuracy & precision?	BTL1	[CO1]	[2]
3.	Classify sensors based on order and give example.	BTL1	[CO1]	[2]
4.	Define sensitivity.	BTL1	[CO1]	[2]
5.	Contrast the needs between static calibration and dynamic calibration?	BTL4	[CO1]	[2]
6.	Identify the types of errors in measurement.	BTL3	[CO1]	[2]
7.	Draw the functional block diagram of measurement system.	BTL1	[CO1]	[2]
8.	What are the output signals of sensors?	BTL1	[CO1]	[2]
9.	Define isolation & grounding sensors.	BTL1	[CO1]	[2]
10.	What is the significance if calibration?	BTL1	[CO1]	[2]

Descriptive Questions (13/15 Marks)

1.	What is meant by error analysis? Explain statistical methods of error analysis with example.	BTL2	[CO1]	[13]
2.	Explain the classification of Sensors in detail.	BTL5	[CO1]	[13]
3.	Discuss about the Sensor output signals.	BTL2	[CO1]	[13]
4.	Discuss about sensor calibration techniques.	BTL2	[CO1]	[13]

5.	With a neat sketch discuss in detail about blocks of measurement system.	BTL2	[CO1]	[13]
6.	Compare and explain static and dynamic characteristics of transducers in measurement system.	BTL4	[CO1]	[13]
7.	Analyze the various performance measures of sensors.	BTL4	[CO1]	[13]
8.	Classify the standards and give example for each level of standard.	BTL4	[CO1]	[13]
9.	The following 10 observations were recorded when measuring a voltage in volts 41.7,42.0,41.8,42.0,41.9,42.5,42.0,41.9,41.8,42.0 Find 1. Mean 2. SD 3. Confidence interval.	BTL4	[CO1]	[15]
10.	Discuss about the types of errors in measurement system and explain how they are corrected?	BT6	[CO1]	[15]

UNIT- II – DISPLACEMENT, PROXIMITY AND RANGING SENSORS

S.No	PART – A (2 Marks)	BT Level	Course Outcome	Marks Allotted
1.	What are the different types of motion sensors?	BTL1	[CO2]	[2]
2.	Justify why LVDT is most suitable as a position measuring device?	BTL2	[CO2]	[2]
3.	Define accelerometer.	BTL1	[CO2]	[2]
4.	What is inductive transducers?	BTL1	[CO2]	[2]
5.	What are the uses of GPS?	BTL1	[CO2]	[2]
6.	Identify any three applications of proximity sensors.	BTL3	[CO2]	[2]
7.	Explain the term LIDAR?	BTL2	[CO2]	[2]
8.	What is RVDT & LVDT?	BTL1	[CO2]	[2]
9.	How to apply the principle of ultrasonic for ranging?	BTL3	[CO2]	[2]
10.	What are the applications of Potentiometer?	BTL1	[CO2]	[2]

PART B - Descriptive Questions (13/15 Marks)

1.	Write a short note on GPS.	BTL2	[CO2]	[13]
2.	Explain the construction and working principle of potentiometer. Evaluate its application as motion sensor.	BTL2	[CO2]	[13]
3.	What is meant by LIDAR? Explain its various components, functionalities and applications.	BTL2	[CO2]	[13]

4.	What is the principle of operation of capacitive accelerometer? With relevant diagram list its various applications.	BTL1	[CO2]	[13]
5.	What is an LVDT? What are the parameters that can be measured by this? Describe with neat diagram and output characteristics the principle of its construction and operation.	BTL2	[CO2]	[13]
6.	Analyse the construction and working principle of Synchro with the help of a neat diagram.	BTL3	[CO2]	[13]
7.	Explain the working of capacitive transducer with neat schematic.	BTL2	[CO2]	[13]
8.	Discuss in detail the construction working and applications of RVDT.	BTL4	[CO2]	[13]
9.	A LVDT output is recorded by a self-balancing potentiometric recorder having its natural frequency of 10Hz and damping ratio of 0.707. The LVDT is excited by 10V at 50Hz power supply. Estimate the maximum frequency of the displacement signal that can be recorded with an error of + 2%.	BTL5	[CO2]	[15]
10.	Propose a case study on comparison of various ranging methods.	BTL6	[CO2]	[15]

UNIT- III – FORCE, MAGNETIC AND HEADING SENSORS

S.No	PART – A (2 Marks)	BT Level	Course Outcome	Marks Allotted
1.	What is force sensors & its classification?	BTL1	[CO3]	[2]
2.	What is gyroscope & its types?	BTL1	[CO3]	[2]
3.	Illustrate the working of compass and state the principle behind it.	BTL2	[CO3]	[2]
4.	Define current sensor & what are the methods of current sensing?	BTL1	[CO3]	[2]
5.	Define Hall Effect.	BTL1	[CO3]	[2]
6.	Define gauge factor of strain gauge.	BTL1	[CO3]	[2]

7.	What are the applications of magneto resistive sensors?	BTL1	[CO3]	[2]
8.	Interpret inclinometer and list the applications of it.	BTL2	[CO3]	[2]
9.	What is meant by Heading Sensors? List out the types.	BTL1	[CO3]	[2]
10.	What is magneto-elastic sensors?	BTL1	[CO3]	[2]

Descriptive Questions (13/15 Marks)

1.	Discuss the operation of strain gauge and how to make use of it as force sensor.	BTL2	[CO3]	[13]
2.	Evaluate the need for magnetic sensors also explain the types, principle, requirement and advantages of magnetic sensors.	BTL2	[CO3]	[13]
3.	Explain the working of inclinometers or tilt sensors.	BTL2	[CO3]	[13]
4.	Discuss about the types of gyroscope in detail	BTL2	[CO3]	[13]
5.	Identify and explain the operation of hall effect current sensor.	BTL2	[CO3]	[13]
6.	Elaborate the features and applications of compass.	BTL2	[CO3]	[13]

7	Examine the principle of operation of load cell and how it is applied in measurement of force.	BTL2	[CO3]	[13]
8.	List the factors and parameters of the sensor does the Hall voltage output depend for a given field condition.	BTL2	[CO3]	[13]
9.	Develop the principle of anisotropic magneto resistive sensors. How is it used in sensing magnetic field? A metallic magneto resistor is placed in magnetic field with its length perpendicular to the field. How does the resistance vary with this field?	BTL6	[CO3]	[15]
10.	Create a comparison of the performance measures of different heading sensors giving the merits, demerits and applications.	BTL6	[CO3]	[15]

UNIT- IV – OPTICAL, PRESSURE, TEMPERATURE AND OTHER SENSORS

S.No	PART – A (2 Marks)	BT Level	Course Outcome	Marks Allotted
1.	Define photoconductive cell & photo voltaic effect.	BTL1	[CO4]	[2]
2.	Identify the types of thermocouples and materials used for constructing thermocouples.	BTL3	[CO4]	[2]
3.	Identify the important features of smart transducer.	BTL3	[CO4]	[2]
4.	List out any two applications that need MEMS sensors.	BTL1	[CO4]	[2]
5.	Draw the basic optical fibre sensors systems.	BTL1	[CO4]	[2]
6.	List the properties of piezoelectric crystals.	BTL1	[CO4]	[2]
7.	Estimate the advantages and disadvantages of Thermistor.	BTL5	[CO4]	[2]
8.	Define Dark resistance and list out some materials used for the construction of LDR.	BTL1	[CO4]	[2]
9.	What is meant by tactile sensor?	BTL1	[CO4]	[2]
10.	What are the components present in acoustic temperature sensors?	BTL2	[CO4]	[2]

Part B: Descriptive Questions (13/15 Marks)

1.	Write a short note on MEMS also Discuss the typical advantages and applications that need MEMS sensors.	BTL2	[CO4]	[13]
2.	Discuss the photovoltaic mode of operation of a photo diode with its diagram and volt- ampere characteristics.	BTL2	[CO4]	[13]
3.	Brief some primary and secondary transducers involved in the measurement of pressure and explain how pressure is measured.	BTL2	[CO4]	[13]
4.	Explain LDR in detail.	BTL2	[CO4]	[13]
5.	Analyze the construction, principle, working of thermistor and its resistance temperature characteristics.	BTL4	[CO4]	[13]
6.	Interpret the statement optical fibre is used for stress sensing. Explain about microbend sensor and discuss its operation.	BTL5	[CO4]	[13]
7.	Define RTD and explain how it is used to measure temperature.	BTL2	[CO4]	[13]
8.	Explain chemical sensors in detail.	BTL2	[CO4]	[13]
9.	Assess the different standards involved in Smart Transducer interface, and	BTL5	[CO4]	[15]

	deduce the need for standardisation.			
10.	Design a temperature monitoring system for pasteurization processing for milk and discuss the features of the system.	BTL6	[CO4]	[15]
UNIT- V – SIGNAL CONDITIONING				
S.No	PART – A (2 Marks)	BT Level	Course Outcome	Marks Allotted
1.	Define signal conditioning.	BTL2	[CO5]	[2]
2.	Assess the need of amplifiers in sensing applications.	BTL5	[CO5]	[2]
3.	Contrast the types of amplifiers that can be used with sensors.	BTL4	[CO5]	[2]
4.	What are the classifications if AC bridges?	BTL1	[CO5]	[2]
5.	Illustrate the components of data acquisition system.	BTL2	[CO5]	[2]
6.	Draw the circuit if inverting amplifier.	BTL1	[CO5]	[2]
7.	Draw the block diagram of power amplifier.	BTL1	[CO5]	[2]
8.	What is A/D conversion in multiplexing?	BTL1	[CO5]	[2]
9.	Why isolation needed in amplifiers?	BTL2	[CO5]	[2]
10.	What are active & passive filters?	BTL1	[CO5]	[2]
PART B: Descriptive Questions (13 & 15 marks)				
1.	Explain in detail about signal conditioning device.	BTL2	[CO5]	[13]
2.	Discuss in detail about the AC bridges.	BTL2	[CO5]	[13]
3.	Explain in detail about DC bridges.	BTL2	[CO5]	[13]
4.	Explain in detail about the types of signal conditioning.	BTL2	[CO5]	[13]
5.	Explain about the construction and working of voltage amplifiers.	BTL1	[CO5]	[13]
6.	Explain filter circuits in detail.	BTL2	[CO5]	[13]
7.	Explain isolation circuits in detail.	BTL2	[CO5]	[13]
8.	Explain single & multi-channel DAS.	BTL2	[CO5]	[13]
9.	Evaluate the importance, performance and applications of various sensors in Automobile industries.	BTL5	[CO5]	[15]
10.	Compose the case study on Medical diagnostic sensors giving the features and advantages.	BTL6	[CO5]	[15]

