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Bengaluru

Mid Term Examinations - October 2026

Date: 05/10/2026 **Time:** 02:00 PM - 03:30 PM

Course Code: ECE3409 **Course Name:** Sensor Technology

Semester: Fifth Semester **Max. Marks:** 50 **Weightage:** 50%

CO - Levels	CO1	CO2	CO3	CO4
Marks	24	24	22	20

PART A: Answer Following Questions. 10 M

Q.N.	Questions	M	CO	BT
1	State any two differences between sensors and actuators, with one example for each.	2	CO1	BT1
2	Using a neat figure, Illustrate response time, rise time and settling time.	2	CO1	BT2
3	Differentiate between resistive and capacitive transduction principles.	2	CO2	BT1
4	Explain the operating principle of a thermoelectric sensor?	2	CO2	BT2
5	State the basic operating principle of a piezoelectric pressure sensor.	2	CO3	BT1

PART B : Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
6	(a) Distinguish accuracy and precision using suitable examples. Identify the errors due to which a sensor can have high precision but poor accuracy. (b) A displacement sensor is calibrated by gradually loading the sensor from 0 to 100 mm and then unloading it back to zero. The Full-Scale Output (FSO) of the sensor is 5 V. The maximum hysteresis error was observed to be 0.08 V. (i) Express the maximum hysteresis error as a percentage of Full-Scale Output. (ii) If the maximum permissible hysteresis error is 1% of FSO, determine whether the sensor satisfies the specified requirement.	10	CO1	BT3
7	(a) Discuss the effects of temperature, pressure, and chemical exposure on sensor performance. (b) A digital weighing sensor is tested using a calibrated standard mass of 5.000 kg. Under identical environmental and operating conditions, five consecutive measurements are recorded as 5.120 kg, 5.118 kg, 5.121 kg, 5.119 kg, 5.122 kg. (i) The mean measured mass. (ii) The absolute error of the sensor with respect to the standard mass. (iii) The relative error as a percentage of the standard mass.	10	CO1	BT3

PART C: Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
8	Explain the operating principle of inductive transduction. Describe how the Hall effect can be used to detect changes in magnetic field.	10	CO2	BT2

9	Explain the operating principle of photoelectric transduction. Explain the working principles of photoconductive, photovoltaic, and photoemissive sensing mechanisms.	10	CO2	BT2

PART D: Answer Any 1 Following Questions. 10 M				
Q.N.	**Questions**	**M**	**CO**	**BT**
10	Explain the construction and working of a Linear Variable Differential Transformer (LVDT) for displacement measurement. Describe how the movement of the ferromagnetic core produces a differential output voltage.	10	CO3	BT2
11	Explain the construction and working principle of a thermistor temperature sensor. Distinguish between NTC and PTC thermistors based on their temperature-resistance characteristics.	10	CO3	BT2

PART E: Answer Any 1 Following Questions. 10 M				
Q.N.	**Questions**	**M**	**CO**	**BT**
12	A piezoelectric accelerometer is used to monitor the vibration of an industrial motor. The accelerometer has a charge sensitivity of 12 pC/g and is connected to a charge amplifier having a feedback capacitance of 150 pF. The charge amplifier is followed by a voltage amplifier with a gain of 10. During normal operation, the motor experiences a peak vibration acceleration of 20 g. (i) Determine the charge generated by the piezoelectric accelerometer for an acceleration of 20 g. (ii) Determine the output voltage of the charge amplifier. (iii) Determine the final output voltage after the voltage amplifier (iv) Determine the overall voltage sensitivity of the measurement system in V/g.	10	CO4	BT3
13	A differential capacitive displacement sensor consista of two identical capacitors. At null position, each capacitor has a capacitance of 50 pF. The sensor has a plate area of 100 mm^2 and an air dielectric with permittivity 8.854×10^{-12} F/m. When the target is displaced toward capacitor C1, the capacitances C1 is 62.5 pF and C2 is 37.5 pF. (i) Determine the displacement of the movable electrode from the null position. (ii) If the signal conditioning circuit scales the output by 5 V, Determine the output voltage.	10	CO4	BT3