

Code: 20EC2501A

**III B.Tech - I Semester – Regular / Supplementary Examinations  
NOVEMBER 2023**

**SENSOR TECHNOLOGY  
(Common to ALL Branches)**

Duration: 3 hours

Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.  
2. All parts of Question must be answered in one place.

BL – Blooms Level

CO – Course Outcome

|               |    |  | BL | CO  | Max. Marks |
|---------------|----|--|----|-----|------------|
| <b>UNIT-I</b> |    |  |    |     |            |
| 1             | a) | Elucidate with a neat block diagram, generalized measurement system and explain the function of various elements with suitable measurement system. | L2 | CO1 | 7 M        |
|               | b) | Discuss various types of sensors with respect to specifications, sensor material and applications.   | L2 | CO1 | 7 M        |
| <b>OR</b>     |    |  |    |     |            |
| 2             | a) | Elaborate on Static characteristics of measurement system with necessary graphs.   | L2 | CO1 | 7 M        |
|               | b) | In detail describe commonly used various units of measurements in sensor technology.   | L2 | CO1 | 7 M        |

## UNIT-II

|   |    |  |    |     |     |
|---|----|--|----|-----|-----|
| 3 | a) | Describe the significance of dielectric constant and explain in detail Capacitance water level sensor with necessary graphs. | L3 | CO2 | 7 M |
|   | b) | Write short notes on specific resistivity, strain sensitivity and moisture sensitivity.                                      | L2 | CO2 | 7 M |

### OR

|   |    |   |    |     |     |
|---|----|---|----|-----|-----|
| 4 | a) | Analyze piezoelectric effect with necessary formulation for voltage generated.            | L4 | CO2 | 7 M |
|   | b) | Design the dynamic models of sensor elements characterized by zero-order and first-order. | L3 | CO2 | 7 M |

## UNIT-III

|   |    |  |    |     |     |
|---|----|--|----|-----|-----|
| 5 | a) | Explain instrumentation amplifier with circuit diagram and obtain the expression for gain. | L2 | CO3 | 7 M |
|   | b) | With necessary diagram discuss the importance of charge – balance V/F converter.           | L2 | CO3 | 7 M |

### OR

|   |    |  |    |     |     |
|---|----|--|----|-----|-----|
| 6 | a) | The four arms of a Wheatstone bridge are arranged as follows: AB is a inductive sensor; BC is a non-reactive resistor $R=1000\ \Omega$ ; CD is $R=833\ \Omega$ in series with $C=0.38\ \mu F$ ; DA is $R=16,800\ \Omega$ . If the supply frequency is 50 Hz, determine the inductance of AB inductive sensor at balance condition. | L3 | CO3 | 7 M |
|---|----|--|----|-----|-----|

|                |    |  |    |     |     |
|----------------|----|--|----|-----|-----|
|                | b) | Write short notes on batteries for low power sensors.  | L2 | CO3 | 7 M |
| <b>UNIT-IV</b> |    |  |    |     |     |
| 7              | a) | Describe with neat diagram microwave occupancy detector for measuring Doppler frequency.                               | L2 | CO4 | 7 M |
|                | b) | Calculate displacement produced in a spring force sensor when applied force = 4N, Spring co-efficient $k=10^{-3}$ m/N. | L3 | CO4 | 7 M |
| <b>OR</b>      |    |  |    |     |     |
| 8              | a) | Analyze accelerometer with its model.  | L4 | CO4 | 7 M |
|                | b) | Analyze the functioning of optical gyroscope.  | L4 | CO4 | 7 M |
| <b>UNIT-V</b>  |    |  |    |     |     |
| 9              | a) | With neat diagram analyze sputtering process in a vacuum chamber for surface processing.                               | L4 | CO5 | 7 M |
|                | b) | Enumerate different types of sensor materials.   | L2 | CO5 | 7 M |
| <b>OR</b>      |    |  |    |     |     |
| 10             | a) | Discuss the role of silicon as a sensing material in sensor fabrication.   | L2 | CO5 | 7 M |
|                | b) | Discuss photolithography techniques.   | L2 | CO5 | 7 M |