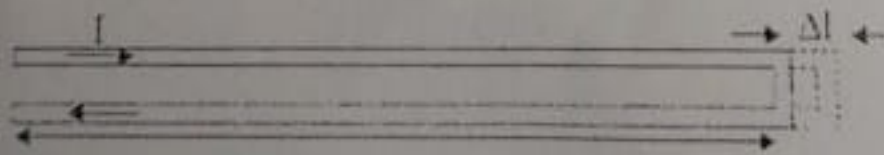


VIT

Vellore Institute of Technology

|                                            |  |                                                                  |                      |
|--------------------------------------------|--|------------------------------------------------------------------|----------------------|
| Name of Examination                        |  | Continuous Assessment Test I, Fall 2024-25 Semester, (AUG. 2024) |                      |
| Course Code: BCSE311L                      |  | Course Mode: CBL06                                               | Duration: 90 Minutes |
| School of Computer Science and Engineering |  | Course Title: Sensors & Actuators <b>DEVICES</b>                 |                      |
|                                            |  | Programme: B. Tech Computer Science and Engineering              |                      |

General Instructions: 1. CLOSE BOOK/Note Book Examinations, 2. Maximum Mark  $5 \times 10 = 50$  Marks

| No. | Sub-division | Question Text                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Marks   | Grade |
|-----|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-------|
|     | ✓            | Digital signal processors, especially those handling audio and video data, must have large dynamic ranges. If the dynamic range of the A/D conversion of a signal processor must be at least 89 dB, what is the number of bits required of the D/A converter?                                                                                                                                                                                                                                                                                                            | 05<br>✓ | 1     |
|     | ✓            | Illustrate the cases where calibration of devices is needed with appropriate examples.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 05<br>✓ | 1     |
|     | ✓            | With necessary circuit diagram analyse the measures to be incorporated in order to overcome three major problems encountered in designing Thermocouple.                                                                                                                                                                                                                                                                                                                                                                                                                  | 10<br>✓ | 2     |
|     | ✓            | Identify and illustrate using relevant plots in detail about a class of temperature sensors based on silicon in which the relatively mild non linearity exists.                                                                                                                                                                                                                                                                                                                                                                                                          | 10<br>✓ | 2     |
|     | ✓            | In testing a pressure sensor for reliability, 1500 sensors are tested for 1000 hours. If ten sensors fail during that period, what is the MTBF of the sensor?                                                                                                                                                                                                                                                                                                                                                                                                            | 05<br>✓ | 1     |
|     | ✓            | Illustrate the transfer function for devices with appropriate examples.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 05<br>✓ | 1     |
|     | ✓            | An actuator is built as a thin Iron rectangular wire (length=200μm) as shown in Figure. A current passes through the wire to heat it up. The free end serves as the actuator (i.e., it can serve to close a switch or to tilt a mirror for an optical switch ;). If the temperature of the Iron wire can vary from 25 °C to 125 °C, what is the largest change in length of the actuator? The dimensions in the figure are given at 20 °C. (note: $\alpha = 12 \times 10^{-6}$ )<br> | 05<br>✓ | 1     |
|     | ✓            | Sketch the design setup and associated relation for Acoustic Temperature Sensing in terms of operations and parametric relation.                                                                                                                                                                                                                                                                                                                                                                                                                                         | 05<br>✓ | 1     |