



VIT

Vellore Institute of Technology

(Deemed to be University under section 3 of U.C.A. Act, 1956)

TE2

SCHOOL OF ELECTRONICS ENGINEERING

Continuous Assessment Test- I

ECE1005 – SENSORS AND INSTRUMENTATION

Programme: B.Tech (ECE)
Semester: Winter 2018-2019
Max. Marks: 50

Date: 22/11/2019
Time: 5:00 to 6:30 PM

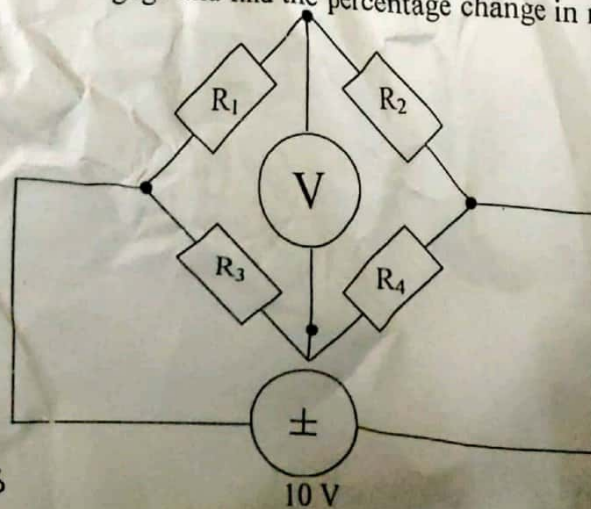
Faculty: K. Govardhan, S. Muthuraja, George Jacob, Suganthan, Sathyanarayanan P, Sakthi Swarrup, Arunkumar

Answer ALL questions

Q1. Few of the characteristics of generic sensor system are rather seem very much identical. Justify [10]
that these are unique by defining and providing a brief note on each.

- i) True Value and Measured Value
- ii) Accuracy and Precision
- iii) Dead Time and Dead Zone
- iv) Span and Range

Q2. Four strain gauges were bonded on to a crane structure of length 10 m which was used to lift [10]
heavy weights. The strain gauges had an unstrained resistance of 100Ω . The top two strain
gauges (R_1, R_3) were having a gauge factor of 3 and the bottom two strain gauges (R_2, R_4) were
having a gauge factor of 4.5. The wheat stone bridge configuration of strain gages is connected
across a dc battery of 10 V. If a pulling force of 1 ton applied on the cantilever produces a
deformation of 5 mm in the cantilever beam, determine the strain developed in each strain gage,
voltage drop across each strain gage and find the percentage change in resistance in each strain
gage.



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- Q3. A sensing system to replicate the working of an automatic steering system needs to be developed in a lab. Identify a resistive multiturn-based sensor which can be deployed for this application. Elaborate on the working of the sensing system for this application. [10]
- Q4. A sensor needs to be developed based on resistive principle to attain complete combustion of fuel in an automotive vehicle. Brief on the choice of materials, principle of operation and the chemical reaction involved in the sensing process. [10]
- Q5. An LVDT was used to measure the liquid level in a big container. The liquid level varies over a total height of 1.5 m. The liquid height variation was translated to the iron piece displacement range of (0 to 100 mm). An iron piece with 75% flux linkage was used in the LVDT. The primary was energized by a 12 V, 1 kHz AC supply. Determine the sensitivity of the LVDT and the range of the it in terms of output voltage of the LVDT. Also determine the output voltage corresponding to steps of $1/5^{\text{th}}$ of the liquid height in the container. [10]

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