Question Paper Code: 37502

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

Seventh Semester

Electronics and Instrumentation Engineering

01UEI702 - INSTRUMENTATION SYSTEM DESIGN

(Regulation 2013)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. The MGS 1100 CO gas sensor (Motorola) has 1000 $k\Omega$ in air, from 30 $k\Omega$ to 300 $k\Omega$ (150 $k\Omega$ typical) for CO concentration of 60 x 10^{-6} (R_{60}), and a ratio R_{60} / R_{400} = 2:5 (typical). If the allowable voltage across the sensing resistor and power dissipation in it are 5 V and 1 mW, design a voltage divider according to figure shown for such a sensor if the expected CO concentration range is from 0 to 400 x10^{-6}.
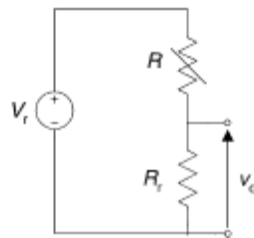
2. Draw the circuit diagram of differential amplifier based on single op-amp and four matched resistors.

3. How the specific signal conditioner for capacitive sensors works?

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5. Where do we on-off control use an controlling a process?

6. Discuss the need for designing Two-position controller action with neutral zone.

7. List out various flow measurement methods.

8. Define square root extractor.

9. Draw the ISA symbol for (a) Orifice plate (b) Rota meter (c) Nozzle..

10. Mention the choice of temperature of a platinum RTD

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Design and briefly discuss amplifier circuit for voltage divider.   (10)

    (ii) Explain how the balancing operation done in Wheatstone bridge.   (6)

Or

    (b) Design an instrumentation amplifier with its merits and application.   (16)

12. (a) Design an ac amplifier with power supply decoupling and explicate the step by step design procedure with diagrams and equations.   (16)

Or

    (b) (i) How linearization done for capacitive bridge circuit.   (8)

    (ii) Design a phase sensitive detector and explain it s application for LVDT.   (8)

13. (a) Explain the design and implementation of electronic PID controller.   (16)

Or

    (b) (i) Design a proportional integral controller with a proportional band of 30 % and integration gain of 0.1 %/(%-s). The 4 to 20 mA input converts to a 0.4 to 2.0 V signal, and the output is to be 0 -10 V. Calculate values of Gp, GI, R2, R1 and C respectively.   (8)

    (ii) Explain and design an annunciator circuit.   (8)

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14. (a) Describe the procedural steps for Bourdon tube design. Discuss also the factors which affect its sensitivity. (16)

Or

(b) Explain the design consideration of rotameter in detail with necessary diagrams and equations. (16)

15. (a) Discuss about the instrument specification sheets for flow and pressure. (16)

Or

(b) (i) Explain with an example the process flow sheet. (10)

(ii) Discuss about the preparation of Instrumentation project. (6)

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