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**Reg. No. :**

**Question Paper Code: 47052**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

Seventh Semester

Electronics and Instrumentation Engineering

14UEI702 - INSTRUMENTATION SYSTEM DESIGN

 (Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. In a bridge circuit, if the range of resistance variation is small and centered about the null value, then the nonlinearity of voltage versus resistance is

 (a) Large (b) Small (c) Infinity (d) Unity

 2. Isolation Amplifiers are used to provide

 (a) High sensitivity (b) Improved stability

 (c) Electric safety (d) error suppression

 3. Schering bridge is used to measure

 (a) Capacitance (b) Potential difference (c) Resistance (d) Inductance

 4. Zero suppression is done in transmitters to improve

 (a) Accuracy (b) Stability (c) Linearity (d) Sensitivity

5. A PI controller has the transfer function $5+(^{1}/\_{s})$ with the unit of time expressed in min

 minutes. The parameters proportional band and reset time for the above controller are

 respectively

 (a) 20% and 0.2 min (b) 20% and 0.2 min

 (c) 20% and 5 min (d) 50% and 5 min

6. In case of an on-off controller, the proportional band is

 (a) 100% (b) Infinity

 (c) Zero (d) Unity

7. A pressure instrument is calibrated from 100 to 600 psi. The span of this instrument is

 (a) 600 (b) 100 (c) 400 (d) 500

8. Rotameter is a

 (a) Variable head flow meter (b) Variable area flow meter

 (c) Electro Magnetic flow meter (d) Target flow meter

9. The given symbol appears in an instrument diagram, It represents a



 (a) Flow rate controller (b) Frequency converter

 (c) Fixed control point (d) Final control element

10. The signal Flow directions between instruments in a plant is given

 (a) Instrument specification sheet (b) Piping and instrumentation diagram

 (c) Process flow sheet (d) Instrument index sheet

PART - B (5 x 2 = 10 Marks)

11. What is the significance of CMRR in differential amplifiers?

12. State the principle of operation of chopper amplifier.

13. Design an electronic two-position controller that turns a 5-V light relay ON when a silicon photocell output drops to 0.22V and OFF when the cell voltage reaches 0.78V.

14. In a temperature transmitter, What is the span adjust resistor required to measure the temperature ranging from 50°C to 300°C using RTD sensor with sensitivity 10Ω/25°C.

15. What is the difference between process flow sheet and instrument index sheet?

PART - C (5 x 16 = 80 Marks)

16.(a) A sensor outputs a range of 20.0 to 250 mV as a variable varies over its range.

 Develop signal conditioning so that this becomes 0 to 5 V. The circuit must have very

 high input impedance. (16)

 Or

 (b) Explain the design of signal conditioning circuit for temperature sensors using

 instrumentation amplifier with required derivations. (16)

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17. (a) Discuss about the design of any one of the AC bridges. Also mention the factors

 affecting the sensitivity and Linearity of AC Bridges. (16)

 Or

 (b) With a neat diagram explain the function of phase sensitive detector. How is it used

 in the signal conditioning of LVDT? (16)

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18. (a) (i) A liquid-level system converts a 4–10-m level into a 4- to 20-mA current. Design

 a three-mode controller that outputs 0–5 V with a 50% PB, 0.03-min reset time,

 and 0.05-min derivative time. Fastest expected change time is 0.8 min. (12)

 (ii)Design an alarm annunciation that provides logic high of 5V when a liquid level

 exceeds 4.2 meters. The level has been linearly converted to a 0-10 volt signal for

 a 0-5 meter level. Hysteresis should be 0.1 volt. (4)

R(z)

$$\frac{1}{s(s+1)}$$

ZOH

C(z)

T

T

-

+

R(z)

$$\frac{1}{s(s+1)}$$

ZOH

C(z)

T

T

-

+

R(z)

$$\frac{1}{s(s+1)}$$

ZOH

C(z)

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R(z)

$$\frac{1}{s(s+1)}$$

ZOH

C(z)

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T

-

+

R(z)

$$\frac{1}{s(s+1)}$$

ZOH

C(z)

T

T

-

+

 Or

 (b) Draw the analog circuit with operational amplifiers to realize ON-OFF controller

 with neutral zone and brief about its design . (16)

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 19. (a) An orifice plate is to be used in conjunction with a differential pressure transmitter

 to measure the flow rate of water in a 0.15 m diameter pipe. The maximum flow rate

 is 50 m3 h−1, the density of water is 103 kg m−3 and the viscosity is 10−3 Pa s. Explain

 why an orifice plate meter is suitable for this application. (16)

Or

 (b) Discuss about the design of bourdon tubes and also discuss about the factors affecting

 its sensitivity. (16)

20. (a) Describe the steps involved in the preparation of Instrumentation project. (16)

 Or

 (b) (i) Prepare a P&I diagram for any one plant level industrial control system. (8)

 (ii) Discuss about the factors to be considered for selecting the analytical instruments

 and control panels. (8)