

TE - sem - VI (CBSSGS) chemical - Instrumentation

Q.P. Code : 574102

23/11/16

(3 Hours)

[Total Marks : 80

- N.B. : (1) Question No.1 is Compulsory.
(2) Solve any three questions out of remaining five questions.
(3) Assume suitable data if required.

1. a) Write short notes on: 15
i) Rupture Discs
ii) Bourdon tube pressure gauge
iii) Ultrasonic method for Level Measurement
- b) A component manufacture constructs certain resistances to be anywhere 5
between $1.14\text{ K}\Omega$ and $1.26\text{ K}\Omega$ and He classifies them to be $1.2\text{ K}\Omega$
resistors.
What is the absolute error? What tolerance should be stated?
2. a) A thermocouple gives an output of 0.4 mV for each degree change in 6
temperature. What will be the word length required when its output passes
through an analogue-to-digital converter if temperatures from 0 to 200°C
are to be measured with a resolution of 0.5°C ?
- b) A stepper motor has a 30-teeth gear with a 5° angle of turn per step. For a 6
desired rotational speed of 200 rpm , what input pulse rate (in pulses per
second) is required?
- c) Write a short note on control valve characteristics. 8
- 3 a) Explain Wheatstone bridge in detail. 5
b) The plate separation of a parallel plate capacitor was changed from 5 inches 5
to 3 inches. Will the capacitance increase or decrease? What is the percent
change in capacitance?
- c) Write short notes on 10
i) Basic process control scheme with diagram.
ii) Layers of protection analysis (LOPA) methods
- 4 a) A Platinum resistance thermometer has a resistance of 100Ω at 0°C and the 6
value of temperature coefficient of resistance is 0.00385 . In operation the
resistance is 101Ω . calculate the temperature.
- b) Explain importance of calibration also explain calibration of Rotameter. 8

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- c) A DAQ card of 12 bit resolution and 20-60 mA analog current loop is used to record above atmospheric pressures. Even a slight change in pressure (~ 1 Pa) needs to be detected. What is the maximum absolute pressure that can be measured? What is the analog input in mA for a pressure change of 10 kPa? **6**
5. a) The output of a thermocouple measuring temperatures from 20°C to 180°C is linearly represented by the standard current range of 4-20 mA. Then, **10**
- (i) What is the current at 110°C ?
 - (ii) What temperature does a current of 8.4 mA represent?
 - (iii) What is the current at 130°C ?
 - (iv) What temperature does a current of 10 mA .
- b) Explain ultrasonic method for level measurement in detail **5**
- c) State the principal involved in following sensing elements- **5**
- i. Linear Variable Differential Transformer.
 - ii. Resistance Temperature Detector.
 - iii. Flapper Nozzle
 - iv. Bellow pressure sensor
 - v. Resistance strain gauge
6. Write short notes on (any four): **20**
- a) Turbine type flow meter
 - b) Mechanical amplifier
 - c) Hot wire anemometer
 - d) Programmable logic controller.
 - e) piezo electric sensing element
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