T.E- VI Sem- Chem

29

10/5/2016

Instrumentation

TE/VI/CBGS/CHEM/INST

QP Code : 574100

(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) Describe various performance characteristics of measuring Instruments. 8
b) A thermocouple gives an output of 0.4 mV for each degree change in 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? 6
c) A DAQ card of 12 bit resolution and 20-60 rnA 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 rnA for a pressure change of 10 kPa? 6

2. a) A component manufacturer constructs certain resistances to be anywhere between 1.14 KΩ and 1.26 KΩ and He classifies them to be 1.2 KΩ resistors. What is the absolute error? What tolerance should be stated? 6
b) A stepper motor has a 30-teeth gear with a 5° angle of tum per step. For a desired rotational speed of 200 rpm, what input pulse rate (in pulses per second) is required?. 6
c) Write in short -control valve characteristics 8

3. a) The plate separation of a parallel plate capacitor was changed from 5 inches to 3 inches. Will the capacitance increase or decrease? What is the percent change in capacitance? 5
b) Write short notes on 15
i) Rupture Discs
ii) Bourdon tube pressure gauge
iii) Ultrasonic method for Level Measurement

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4. a) Explain Wheatstone bridge in detail. 5

b) A Platinum resistance thermometer has a resistance of 100Ω at 0°C and the value of temperature coefficient of resistance is 0.00385. In operation the resistance is 101Ω calculate the temperature. 5

c) Write short notes on- 10

i) Layers of protection analysis (LOPA) methods

ii) Basic Process control scheme with Diagram.

5. a) The output of a thermocouple measuring temperatures from 20°C to 180°C OC 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 importance of calibration also explain calibration of Rotameter. 5

c) Explain data acquisition and conversion system. 5

6. Write short notes on (any four): 20

a) Signal conditioning

b) Capacitive type sensing element

c) Hot wire anemometer

d) Piezo electric sensing element

e) Electromagnetic flow meter.