

Name :

Roll No. :

Invigilator's Signature :

CS/B.Tech/ICE(O)/SEM-5/IC-501/2012-13

2012

INDUSTRIAL INSTRUMENTATION-I

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :
 $10 \times 1 = 10$

i) Which type of thermocouple has the maximum sensitivity ?

- | | |
|-----------|------------|
| a) T-type | b) K-type |
| c) E-type | d) J-type. |

ii) Which type of pressure measurement gauge can measure below 10^{-4} torr ?

- | | |
|---------------------|-----------------|
| a) Ionisation gauge | b) McLeod gauge |
| c) Pirani gauge | d) Manometer. |



- x) Viscometer is an instrument which measures the consistency of
- Newtonian fluid
 - Gases
 - Non-Newtonian fluid
 - all of these.
- xi) Density applies to a substance in
- solid state
 - liquid state
 - gaseous state
 - all of these.

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

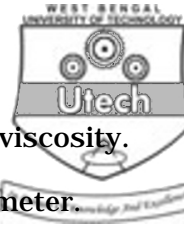
- Explain the ultrasonic method of temperature measurement.
- What is hydrometer ? 2
 - What are the advantages and disadvantages of using hydrometer ? 3
- Describe the working principle of total radiation thermometer with a labelled sketch.
- How is the low pressure measured by McLeod gauge ? What is its measurement range ? $4 + 1$
- Derive the expression for differential pressure in a well type manometer. 4
 - Is it advantageous than *U*-tube manometer ? 1

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

- Explain the working principle of a bimetallic thermometer. 8
 - What are the most common applications of bimetallic elements ? 2
 - Explain the necessity of cold junction compensation for temperature measurement using thermocouple. 5



8. a) Define absolute viscosity and kinematic viscosity. 4
- b) Explain the operation of industrial viscometer. 5
- c) Explain with schematic diagram the principle of operation of gas densitometer. 6
9. a) Define Pt-100. Draw its characteristics. Write down the resistance-temperature relationship. 2 + 2 + 4
- b) Design an electronic circuit using an RTD which may provide 0 – 200 mV output corresponding to 0 – 200°C. Assume that $R_0 = 100 \Omega$ and $R_{200} = 180 \Omega$. 7
10. a) Explain with schematic diagram, the principle of operation of pyrometer for temperature measurement. 8
- b) Describe the operation of Pirani gauge for vacuum measurement. 7
11. a) Distinguish between gauge pressure, absolute pressure and differential pressure. 5
- b) Explain the operation of C-type Bourdon gauge. 5
- c) Find out the reading and error in Bourdon gauge reading if it is mounted 10 metre below the water pipeline and 10 metre above the water pipeline, whose pressure is to be measured.
- (Assume water line pressure as 10 kg/cm^2). 5
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