B.E. / B. Tech. Instrumentation Engineering (Model Curriculum) Semester-IV

IN404 - Industrial Instrumentation

P. Pages : 2 **GUG/S/25/14017**

Time : Three Hours * 2 3 5 7 * Max. Marks : 80

Notes : 1. All questions carry marks as indicated
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) An experiment is done using a Cu-Cn thermocouple with cold junction at 0°C, the emf obtained at boiling point of water is 10mv. Also, the emf obtained at the boiling point of Sulphur (440°C) is 25mv. Calculate the constants 'a', and 'b', if the emf relationship is a combination of the Seeback and the Peltier effect. **8**

b) Explain the following laws associated with thermocouples: **8**
I. Seeback effect
II. Peltier effect
III. Thompson effect.
Enlist various types of thermocouples.

OR

2. a) Describe with principle, construction, and working of Resistance Temperature Detector. Also list its range and disadvantages. **8**

b) A platinum resistance thermometer has a resistance of 140 & 100 Ω at 100°C & 0°C respectively. If its resistance becomes 305 Ω, when it is in contact with hot gas, determine the temperature of the gas. The temp. coeff. of platinum is $0.0039^{o}C^{-1}$. **8**

3. a) Draw and explain the working of the U tube manometer. Enlist different types of manometers used in industry. **8**

b) Illustrate McLeod gauge used in the low-pressure measurement along with its derivation. **8**

OR

4. a) Draw & explain the set-up for calibration of pressure gauge using dead weight tester. **8**

b) Explain the scheme for measurement of pressure using strain gauge. **8**

5. a) A submarine moves horizontally in the sea and has its axis much below the surface of sea water. A pitot tube properly placed just in front of the submarine is connected to a differential pressure gauge. **8**
The pressure differential between the pitot pressure and static pressure was found to be $25KN/m^2$. Find the speed of submarine if the density of sea water is $1026\,kg/m^3$.

b) Explain variable area meter as a flowmeter. Also explain its advantages and applications. **8**

OR

6.	a)	List different differential pressure type flow meters. Describe Orifice meter in detail.	**8**
	b)	Explain construction and working principle of Electromagnetic flow meter with suitable diagram.	**8**
7.	a)	Explain principle, construction working of radioactive type level sensor. List advantages and disadvantages.	**8**
	b)	Write a short note on Air bubbler method. List its applications.	**8**

OR

8.	a)	Explain smart sensors in short.	**8**
	b)	Explain principle, construction working of ultrasonic type level sensor. Give its significance in level measurement.	**8**
9.	a)	Illustrate dry bulb and wet bulb psychrometer.	**8**
	b)	Explain the techniques for measurement of moisture in air. Explain any one method with suitable diagram.	**8**

OR

10.	a)	Explain the working principle of electrolytic hygrometers with neat diagram.	**8**
	b)	Draw and explain working of Hair Hygrometer. List its advantages and disadvantages.	**8**

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