

Code No: A109210802

R09**Set No. 2**

II B.Tech I Semester Examinations, May 2011
PROCESS INSTRUMENTATION
Chemical Engineering

Time: 3 hours

Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks

1. Discuss the construction and characteristics of bimetallic thermometers. What are the materials used for bimetallic thermometers and what are its advantages? [15]
2. What are the instruments available for the measurement of colours? Explain in detail. [15]
3. Describe the "venturi Tube" with a neat diagram. [15]
4. Explain pirani vacuum gage & its circuit with a neat diagram. [15]
5. Draw and explain Callendar-Griffiths Bridge with necessary equations. [15]
6. How do you measure the "surface level between two immiscible liquids of differing specific gravity"? Explain with a neat diagram. [15]
7. In a temperature - measurement application there is question of accuracy. In the following examples briefly describe methods for checking accuracy, assuming no physical limitations:
 - (a) Mercury thermo meter measuring temperature in a closed vessel containing hot liquid at 300⁰F.
 - (b) Iron- constantan thermocouple with potentiometer pyrometer measuring temperature in an air- annealing furnace at 1200⁰F. [8+7]
8. (a) Thermocouple has its hot junction at 500⁰ F and its reference junction at 75⁰ F. One of the thermocouple wires becomes heated to 600⁰ F at a point mid way between hot and cold junctions. What effect does this have?
 - (b) Describe the differences in Peltier heat and joule heat. Why is the joule heat not important in the theory of the thermocouple? [9+6]

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1. Explain the principle involved in 'Rotameter' & Explain the advantages of it. [15]
2. Explain the differential - pressure manometer for measurement of liquid level in closed vessel? [15]
3. What are the elements in an instrument? Discuss the function of each with reference to any instrument. [15]
4. (a) Explain elaborately with a neat sketch refractometer. What are its advantages?
(b) Discuss spectroscopic analysis by absorption and indicate where it can be applied. [7+8]
5. Explain, in detail, the static and dynamic characteristics of measuring instruments. Explain, the principle, construction and working of an optical pyrometer [15]
6. (a) Write the accuracy involved in the various thermocouples.
(b) Write short notes on importance of corrosion for the selections of thermocouple.
(c) Explain with neat sketch of tutor - type thermocouple and show various parts in it. [5+5+5]
7. What types of flow meters operate most satisfactorily when density, viscosity, or temperature of the following fluid fluctuates? [15]
8. A diaphragm seal using an oil of specific gravity 0.8 is installed in a pressure-gage line 20 ft above the center line of the gage. What is the static correction for the gage? [15]

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R09**Set No. 1**

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1. (a) Discuss about pressure, vacuum & head.
(b) Explain about "enlarged-leg manometer" with a neat figure. [6+9]
2. (a) Explain the principle, construction and working of an optical pyrometer.
(b) Explain the working of radiation pyrometer. [7+8]
3. Describe the methods of measurement of moisture in paper, textile and Lumber. Explain the principle. [15]
4. Make a list of instruments and primary elements having good over-all operation in the following ranges:
 - (a) -100°F
 - (b) $0-100^{\circ}\text{F}$
 - (c) $100-600^{\circ}\text{F}$
 - (d) $1000-1400^{\circ}\text{F}$
 - (e) $2000-2800^{\circ}\text{F}$. [15]
5. What are Peltier, Seebeck and Thomson effects? How are they used in thermocouples. [15]
6. (a) A flow meter is calibrated 0 to 10000 cu ft per hr. the accuracy is specified as within ± 0.75 per cent above 20 per cent of scale reading. What static error in units is possible if the instrument indicates 8000 cu ft per hr.
(b) Write short notes on vapour activated thermometers. [10+5]
7. It is desired to know the weight contents of a liquid - catalyst storage chamber. If weighing methods are too expensive, would you recommend a free-float level gage or a diaphragm-box and pressure-gage system? Why? [15]
8. How Viscosity is measured in continuous industrial operations? Explain. [15]

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R09**Set No. 3**

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Chemical Engineering

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Answer any FIVE Questions
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1. (a) What is industrial resistance thermometer bulb and how to arrange them?
(b) Write short notes on platinum resistance thermometers. [7+8]
2. Describe industrial thermocouples in detail with neat diagrams. [15]
3. Derive the equations pertaining to the flow of compressible fluids in pipes. [15]
4. Name some devices used for liquid composition analysis. With a neat diagram describe its principle of operation. [15]
5. Describe "electric pressure gage" with a neat diagram. [15]
6. (a) Discuss the principle, construction and operation of resistance thermometer.
(b) Constructional features of transmitting instruments.
(c) Static characteristics of measuring instruments. [5+5+5]
7. A temperature of 150°F is to be measured in a gas holder located one mile from the point where a recorder is desired. Select an instrument for this service. [15]
8. A vessel of 60 ft height is filled by adding a second immiscible liquid (sp gr 0.6) above the first and allowing the first (sp gr 1.0) to run out the bottom. If a pressure gage is used to measure the pressure at the bottom of the tank, what is the range of the pressure gage to indicate the full motion of the interface? [15]
