Code No: 07A7EC06 **R07** **Set No. 2**

IV B.Tech I Semester Examinations,May 2011
INSTRUMENTATION AND CONTROL SYSTEMS
Common to Mechanical Engineering, Automobile Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain how Spring balances can be used for measurement of force. Describe their working ,advantages and limitations.
   (b) Define the Psychometric terms:
      i. Relative humidity
      ii. Dew point temperature
      iii. Wet bulb temperature. [10+6]
2. (a) State the advantages of a closed loop system.
   (b) A constant water level is to be maintained in a boiler. Suggest a suitable automatic level control system with a block diagram and explain its working. [6+10]
3. (a) What is a Bonded strain gauge?
   (b) List the main advantages and limitations of semiconductor strain gauges.
   (c) Explain one method of temperature compensation using an adjacent arm compensating gauge. [2+6+8]
4. (a) What are pyrometers? Indicate their working principles.
   (b) By means of neat sketches, explain the working of linear variable differential transformer (LVDT). [6+10]
5. Explain the construction ,principle of working and advantages of following type of accelerometers.
   (a) Strain gauge accelerometer
   (b) Variable resistance vibration sensor
   (c) Capacitance vibration sensor [6+5+5]
6. (a) Distinguish between:
      i. Manometer
      ii. Piezometer.
   (b) Explain the principle of operation of a diaphragm gauge? [8+8]
7. Show that there exists a linear relationship between the volume flow rate and displacement of float in the case of a rotameter .Prove that if the density of the float material is made twice that of flowing fluid, the volume flow rate becomes independent of the density of the flowing fluid and compression is almost complete for all flows. [16]

8. Show that mercury in glass thermometer is a first order instrument. How can be the time constant value reduced and sensitivity value increased for the thermometer? [16]

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Code No: 07A7EC06 **R07** **Set No. 4**

IV B.Tech I Semester Examinations,May 2011
INSTRUMENTATION AND CONTROL SYSTEMS
Common to Mechanical Engineering, Automobile Engineering
Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What are the various direct methods to measure force measurement? Explain any one of the working principle.
   (b) Describe with neat sketch, explain the working principle of Sling hygrometer [8+8]

2. (a) Name a few applications of pressure measurement.
   (b) What is the difference between atmospheric pressure and absolute pressure?
   (c) Illustrate with the suitable examples, classify the pressure measurements. [2+4+10]

3. (a) Define the terms Gauge length , Deformation sensitivity and strain sensitivity.
   (b) Derive an expression for gauge factor of resistance strain gauge. [6+10]

4. (a) Distinguish between the following:
      i. Error & accuracy
      ii. Precission & bias
      iii. Zero drift and sensitivity drift
   (b) Discuss the step and ramp input response to first order instruments. [6+10]

5. (a) Sketch and explain the working principle of eddy current tachometer.
   (b) Explain how a vibrometer is calibrated to measure acceleration. [12+4]

6. (a) Differentiate a feed back and non-feedback control system.
   (b) Illustrate with example, explain working of open loop speed control system. [6+10]

7. Explain what is Flow visualization. Describe the construction and working of a Laser Doppler Anemometer (LDA).What are its advantages and its limitations? [16]

8. (a) Differentiate between rare metal thermocouples and base metal thermocouples.
   (b) Design a measurement system for displacement measurement using LDR (Light dependent resistor) as sensor. [6+10]

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Code No: 07A7EC06 **R07** **Set No. 1**

IV B.Tech I Semester Examinations,May 2011
INSTRUMENTATION AND CONTROL SYSTEMS
Common to Mechanical Engineering, Automobile Engineering
Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Explain the construction, working and applications of the following types of flow Meters:
   (a) Magnetic flow meter
   (b) Turbine flow meter. [8+8]
2. (a) Explain the important static characteristics.
   (b) Explain the following functional blocks by means of examples.
      i. Variable conversion element
      ii. Data manipulation element
      iii. Data transmission element. [8+8]
3. (a) Classify temperature measuring instruments.
   (b) Explain working of various types of solid expansion thermometers. [6+10]
4. (a) Describe the construction and working principle of a d.c. tachometer generator. Explain its advantages and disadvantages.
   (b) Explain the working principle of Resonance or vibrating reed tachometer. [10+6]
5. (a) List the main advantages of semiconductor strain gauges.
   (b) Three gauges in the form of a rectangular rosette are mounted on a steel plate having E = 200GPa and Poision's ratio ν =0.33. The readings of the 3 gauges are $\varepsilon_1 = 72 \times 10^{-6}, \varepsilon_2 = 120 \times 10^{-6}, \varepsilon_3 = 248 \times 10^{-6}$. Calculate the Principal strains and stresses, the maximum shear stress, and the orientation of principal stresses. [4+12]
6. (a) Define absolute pressure, gauge pressure and vacuum Pressure.
   (b) Explain how strain gauges can be used for measurement of pressure .Describe the construction of a foil type bonded strain gauge used for measurement of pressure. [6+10]
7. (a) Describe the construction and working of a water vortex dynamometer. What are the reasons for its popularity?
   (b) Explain the working of a hydraulic load cell for the measurement of force. [8+8]

8. (a) Sketch and explain position control using servo motor.
   (b) Sketch and explain open loop and closed loop temperature control system with block diagrams.
   (c) Briefly explain about positive feedback and negative feed back. [6+6+4]

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Code No: 07A7EC06 **R07** **Set No. 3**

IV B.Tech I Semester Examinations,May 2011
INSTRUMENTATION AND CONTROL SYSTEMS
Common to Mechanical Engineering, Automobile Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define the various terms related to humidity.
   (b) What are the hygroscopic materials? Explain the working of any one of the absorption hygrometers. [8+8]
2. (a) What standard inputs are considered for obtaining dynamic characteristics of measurement systems? Plot the signals.
   (b) Briefly explain the reasons for systematic errors in measurement systems. [8+8]
3. (a) Distinguish between static pressure and stagnation pressure.
   (b) What are the instruments used for measurement of low pressure and low vacuum pressure.
   (c) Explain with a neat sketch the principle of working of differential manometer. [4+4+8]
4. Describe the working of Ultrasonic flow meter. Explain the different techniques used for measurement of flow velocity. What are the advantages and limitations. [16]
5. (a) Describe the working principle of Fly ball tachometer. What are its advantages and disadvantages?
   (b) Explain the working principle of Resonance or vibrating reed tachometer. [10+6]
6. (a) Describe the tension measurement using strain gauge with neat diagram.
   (b) Explain the principles operation of electrical resistance strain gauges and their merits and demerits. [8+8]
7. (a) List the requirements of a control system
   (b) Propose a control system to fill a container with water after it is emptied through a stop cock at the bottom. The system must automatically shut of the water when the container is filled. Draw the block diagram of the proposed system . Which component or components comprise the plant ,the controller and feed back. [4+12]
8. (a) Differentiate between thermisters and RTDs.
   (b) With neat sketches, explain the working of an optical pyrometer. What are its advantages and limitations. [6+10]

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