Code No: R05410304 **Set No. 1**

IV B.Tech I Semester Regular Examinations, November 2008
INSTRUMENTATION AND CONTROL SYSTEMS
(Common to Mechanical Engineering and Automobile Engineering)
Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Distinguish between direct and indirect methods of measurement with suitable examples.
   (b) What are desired, modifying and interfering inputs for an instrumentation system? How do you correct the effects of modifying and interfering inputs by the method of signal filtering? Explain by means of suitable examples.[6+10]
2. (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]
3. (a) Discuss various types of elastic pressure sensing elements used in electrical Transducers.
   (b) Describe the application, advantages and limitations of elastic diaphragm gauges. [10+6]
4. (a) Explain how "a wire mounted normal to probe axis", type hot wire anemometer is used in flow measurement. Enumerate the principle of operation and its limitations.
   (b) List out the important of calibration of flow measuring instruments. [12+4]
5. (a) Describe the working principle of D.C.Tachometer generator and what are its advantages and disadvantages.
   (b) Why vibrations has to be measured. How vibrations are measured? [10+6]
6. (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]
7. (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]

8. (a) What are the requirements of control systems.

   (b) The operation of driver driving an automobile on the road and identify the components, input and output of the human system. [4+12]

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Code No: R05410304 **Set No. 2**

IV B.Tech I Semester Regular Examinations, November 2008
INSTRUMENTATION AND CONTROL SYSTEMS
(Common to Mechanical Engineering and Automobile Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Explain the dynamic response characteristics of first order instruments to step, ramp and sinusoidal inputs. [16]

2. (a) List electrical transducers for measurement of linear and angular displacement.
   (b) Explain by means of neat sketches how wire wound and carbon film potentiometers can be used for measurement if linear and angular displacement. [4+12]

3. (a) Describe the construction, working and theory of a Bridgman gauge for measurement of high pressures.
   (b) Briefly explain the principle employed in manometers used for the measurement of pressure. [10+6]

4. Enumerate the principle of operation of the following:
   (a) Capacitive level indicator
   (b) Ultrasonic level measuring instrument
   (c) Magnetic level indicator
   (d) Cryogenic fuel level indicator. [16]

5. (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]

6. (a) If a strain gauge has a low gauge factor, what does it indicate.
   (b) Name the various types of strain gauges for different applications.
   (c) Distinguish between bonded and unbonded type of resistance strain gauge. [3+3+10]

7. (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]

8. (a) What is a servo mechanism? Explain
   (b) Describe the operation of a driver driving an automobile on the road and identity the components, input and output of the human system. [8+8]

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Code No: R05410304 **Set No. 3**

IV B.Tech I Semester Regular Examinations, November 2008
INSTRUMENTATION AND CONTROL SYSTEMS
(Common to Mechanical Engineering and Automobile Engineering)
Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Distinguish between direct and indirect methods of measurement with suitable examples.
   (b) What are desired, modifying and interfering inputs for an instrumentation system? How do you correct the effects of modifying and interfering inputs by the method of signal filtering? Explain by means of suitable examples.[6+10]
2. (a) Classify temperature measuring instruments.
   (b) Explain working of various types of solid expansion thermometers. [6+10]
3. (a) Explain the bellows arrangement used to measure absolute pressure gauge & differential pressure gauge.
   (b) How can a strain gauge be used to measure pressure with the help of flattened tube pressure cell. [8+8]
4. (a) List the various quantity flow meters and explain the working of a Nutating disk flow meter.
   (b) Give details of the magnetic flow meter and Ultrasonic flow meter? [6+10]
5. (a) How will you determine the speed of hermitically sealed compressor installed in a refrigerator? Explain its working principle.
   (b) What is the basic difference in design and application between vibrometer and accelerometer. [8+8]
6. (a) What are the advantages and disadvantages of mechanical strain gauges over optical srtain gauges.
   (b) A 200 Ω strain gauge is bonded to a steel bar which is subjected to a tensile load. Cross sectional area of the bar is $0.9 \times 10^{-4} m^2$ and E= $200 GN/m^2$.If load of 100 kN produces a change of 1.5 Ω in the gauge resistance. Determine the gauge factor of the gauge. [6+10]
7. (a) How absolute humidity is measured?
   (b) What are load cells? Name the application of load cells. [10+6]
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: R05410304 **Set No. 4**

IV B.Tech I Semester Regular Examinations, November 2008
INSTRUMENTATION AND CONTROL SYSTEMS
(Common to Mechanical Engineering and Automobile Engineering)
Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Explain the dynamic response characteristics of first order instruments to step, ramp and sinusoidal inputs. [16]

2. (a) List electrical transducers for measurement of linear and angular displacement.
   (b) Explain by means of neat sketches how wire wound and carbon film potentiometers can be used for measurement if linear and angular displacement. [4+12]

3. (a) With the aid of neat sketch, explain the working principle of dead ?weight type Tester.
   (b) Derive an equation for the differential pressure based on the movement of the liquid in the inclined column only. [8+8]

4. (a) Enumerate the principle of operation, construction details, advantages and limitations of hotwire anemometer.
   (b) What are advantages and limitations direct level over indirect level measurements. [10+6]

5. (a) Explain the construction, working, advantages and disadvantages of a Photoelectric Tachometer
   (b) How is measurement of vibrations on large structures done? Explain the method in detail. [8+8]

6. For a delta rosette, the following readings are obtained with gauges mounted on a steel specimen :
   $\varepsilon_1 = 200\mu\ cm/cm$, $\varepsilon_2 = -400\mu\ 10^{-6}\ cm/cm$, $\varepsilon_3 = 100\mu\ cm/cm$
   if a gauge factor is 2.0, determine :
   (a) direct and shear strains in the direction of one of the gauge axis
   (b) Principal stresses and strains
   (c) Principal angles with respect to the direction of one of the other gauge axis. [16]

7. (a) Sketch and explain the constructional details and working of a dew point meter.
   (b) Describe the method of measuring torque of rotating shafts using strain gauges. [10+6]

8. (a) What is a servo mechanism? Explain
   (b) Describe the operation of a driver driving an automobile on the road and identity the components, input and output of the human system. [8+8]

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