Code No: R05312001 **Set No. 1**

III B.Tech I Semester Regular Examinations, November 2008
INSTRUMENTATION AND CONTROL SYSTEMS
(Production Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Differentiate between accuracy and precision.
   (b) How do second order instruments respond to ramp input? [6+10]
2. (a) What are thermopiles? What are their advantages?
   (b) Explain by means of neat sketches, the working of Total radiation pyrometer. [6+10]
3. (a) Define pressure? How is it different from stress?
   (b) Describe the construction and working of a Bourdon tube. Describe the C type, spiral type and helical type Bourdon gauges with neat diagrams. [4+12]
4. Describe in detail with neat sketches.
   (a) Float operated Rheostat
   (b) Hook Level indicator
   (c) Turbine flow meter. [4+6+6]
5. Differentiate the following:
   (a) Centrifugal speed Tachometer Vs Vibrating reed tachometer
   (b) Hand speed indicator Vs Revolution counter
   (c) Tachoscope Vs Slipping clutch tachometer. [6+5+5]
6. (a) What do you understand by a strain rosette? How is it used.
   (b) A rectangular rosette is placed an steel plate and indicates the following strains: $\varepsilon_1 = 560 \times 10^{-6}$ cm/cm, $\varepsilon_2 = -150 \times 10^{-6}$ cm/cm, $\varepsilon_3 = 460 \times 10^{-6}$ cm/cm. [8+8]
7. (a) Why humidity is to be measured?
   (b) Define the Psychometric terms.
      i. Dry air
      ii. Moist air
      iii. Saturated air
      iv. Absolute humidity
      v. Relative humidity
      vi. Dry bulb temperature

vii. Wet bulb temperature [2+14]

8. (a) Distinguish between Manual control system and Automatic control systems.

   (b) Describe typical closed-loop control systems that can be used in order to control the temperature of water being heated by steam, and Draw the block diagram of the arrangement and mention the use of feed back in application. [8+8]

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Code No: R05312001 **Set No. 2**

III B.Tech I Semester Regular Examinations, November 2008
INSTRUMENTATION AND CONTROL SYSTEMS
(Production Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Classify measuring instruments.
   (b) Discuss the dynamic response characteristics of second order instruments to step input for critical damping condition. [6+10]

2. (a) Explain the working of vapour pressure thermometer by means of neat sketches.
   (b) Explain the laws of thermocouple. [8+8]

3. (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]

4. (a) Describe construction and working of Turbine flow meters. Explain how the output is obtained in digital form for both flow rate and total flow.
   (b) Describe the working principle of Gamma ray liquid level indicator. [10+6]

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. 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) How do you measure the relative humidity using Hygro meter?
   (b) Explain the method of measuring force using strain gauges. [10+6]

8. (a) Explain the concept of control in engineering. List several control devices with which you are familiar and describe any two of them.
   (b) Describe a speed control system for controlling the speed of an IC engine. [6+10]

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Code No: R05312001 **Set No. 3**

III B.Tech I Semester Regular Examinations, November 2008
INSTRUMENTATION AND CONTROL SYSTEMS
(Production 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. With neat sketches explain the different principles of working of capacitive transducers can be used for the measurement of linear and angular displacement. [16]

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) With a neat sketch explain the working principle of a bubbler gauge
   (b) Describe construction and working of an Electromagnetic flow meter. Explain its advantages and disadvantages. [6+10]

5. (a) Explain the measurement of vibration by the reed vibrometer.
   (b) Explain the working of piezoelectric accelerometer with neat sketch. [8+8]

6. For a Rectangular rosette, the following readings are obtained with gauges mounted on a steel specimen :
   $\varepsilon_1 = 200\mu\ cm/cm$, $\varepsilon_2 = -400\mu\ cm/cm$, $\varepsilon_3 = 100\mu\ cm/cm$
   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) Explain how a sling psychrormeter is used to determine the dry and the wet bulb Temperatures.
   (b) Explain the method of measuring force using strain gauges. [10+6]

8. (a) Distinguish between:
      i. Position control
      ii. Velocity control
      iii. Acceleration control
   (b) Explain the terms involved in a control system. What are the advantages of feed back control system. [8+8]

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Code No: R05312001 **Set No. 4**

III B.Tech I Semester Regular Examinations, November 2008
INSTRUMENTATION AND CONTROL SYSTEMS
(Production Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Differentiate between error, inaccuracy and precession by means of examples.
   (b) What is transfer function? Find the transfer function for a spring mass damper system for which input is force and output is displacement. [6+10]

2. (a) State and explain laws of intermediate metals and intermediate temperatures for thermocouples. How are they useful in thermocouple thermometrs?
   (b) Explain by means of neat sketches, the how capacitive transducers can be used for displacement measurement based on change in overlap area of plates and change in dielectric between plates. [6+10]

3. Explain the working principle of
   (a) Ionization gauge and
   (b) Knudsen gauge. [8+8]

4. (a) Explain the working principle of Capacitance liquid level sensor.
   (b) Describe the working of a cryogenic fuel level indicator. What are its advantages and limitations? [6+10]

5. Explain the construction ,principle of working and advantages of following type of accelerometers.
   (a) LVDT accelerometer
   (b) Piezoelectric accelerometer. [8 × 2 = 16]

6. A rectangular rosette was used to determine the stress situation in a certain application and the following observations were made with gauges mounted on the test specimen:
   $\varepsilon_1 = 250\mu\ cm/cm$, $\varepsilon_2 = -200\mu\ cm/cm$, $\varepsilon_3 = -500\mu\ cm/cm$
   Determine the principal strains, principal stresses, maximum shear stress and the location of principal planes. Assume elastic constants for steel E = 2×105 N/mm^2 and μ =0.3 [16]

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 are the basic elements of a control system? Explain

(b) Describe a control system to fill a tank with water after it is emptied through an output at the bottom. This system automatically stops the inflow of water when the tank is filled. Draw the block diagram of the system. [8+8]

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