Code No: RR321404 **Set No. 1**

III B.Tech II Semester Regular Examinations, Apr/May 2006
INSTRUMENTATION AND CONTROL SYSTEMS
(Mechatronics)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Describe the principle of operation of a piezo-electric transducer. Identify the input and output of the system. [16]

2. Describe the method of measuring speed using
   (a) Capacitor type Impulse Tachometer. [16]
   (b) Tachometers.

3. (a) List all industrial thermocouples giving their elements and temperature ranges.
   (b) Why cold junction compensation is required? Explain an automatic cold junction compensation method. [8+8]

4. (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 neat sketch the principle of working of Mc Leod Gauge. [16]

5. Explain in detail with neat sketches
   (a) liquid level measurement using capacitive transducer.
   (b) Cryogenic fuel level indicator. [8+8]

6. (a) Compare the working of a servo and digital accelerometers.
   (b) Name the different types of hygrometers used for measuring humidity. [16]

7. (a) Explain the method of measuring force using strain gauges.
   (b) Why bridge circuit is necessary for a strain gauge? Explain how the bridge circuit is used with a strain gauge. [8+8]

8. (a) Draw the schematic block diagram for an automatic washing machine and identify the input and output of the system.
   (b) Draw the block diagram of a biological control system when a human hand approaches to an object to grip it. Discuss the functions of various elements of the system. [11+5]

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Code No: RR321404 **Set No. 2**

III B.Tech II Semester Regular Examinations, Apr/May 2006
INSTRUMENTATION AND CONTROL SYSTEMS
(Mechatronics)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Describe about the step response of second order system.
   (b) A response test on a thermometer was thrust into temperature controlled bath of water maintained at 100^0C and the time was observed as the indicated temperature reached preselected values giving the following readings.

Times(sec)	0.0	1.2	3.0	5.6	8.0	11.0	15.0	18.0
Temp(deg c)	20	40	60	80	90	95	98	99

   Draw the response curve on a graph paper and show that it follows closely the form of a simple lag with a time constant of 4 secs. [8+8]

2. (a) Explain the construction and working of an A.C. Tachometer generator. Describe its limitations.
   (b) Explain the construction, working of a photoelectric tachometer. Explain its advantages and disadvantages. [16]

3. (a) What is a thermistor? Write different types.
   (b) What is the range of operation of thermistors? State its applications. [8+8]

4. (a) Differentiate between pirani-gauge and thermo-couple type conductivity gauge.
   (b) Discuss the merits and demerits of the following pressure sensing elements
      i. Capsule
      ii. Bourdon tube
      iii. Bellows

   [16]

5. (a) Explain the functioning of ultrasonic flow meter with a neat diagram.
   (b) With a neat diagram, explain the working of turbine flow meter and point out its limitations. [6+10]

6. (a) How relative humidity is measured using hygrometer?
   (b) A seismic type accelerometer is relatively rugged compared to a seismic type vibrometer. Comment. [16]

7. (a) Explain the method of measuring force using strain gauges.

(b) Why bridge circuit is necessary for a strain gauge? Explain how the bridge circuit is used with a strain gauge. [8+8]

8. (a) Draw the schematic block diagram for an automatic washing machine and identify the input and output of the system.

(b) Draw the block diagram of a biological control system when a human hand approaches to an object to grip it. Discuss the functions of various elements of the system. [11+5]

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Code No: RR321404 **Set No. 3**

III B.Tech II Semester Regular Examinations, Apr/May 2006
INSTRUMENTATION AND CONTROL SYSTEMS
(Mechatronics)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Describe about the step response of second order system.
   (b) A response test on a thermometer was thrust into temperature controlled bath of water maintained at 100^0C and the time was observed as the indicated temperature reached preselected values giving the following readings.

Times(sec)	0.0	1.2	3.0	5.6	8.0	11.0	15.0	18.0
Temp(deg c)	20	40	60	80	90	95	98	99

   Draw the response curve on a graph paper and show that it follows closely the form of a simple lag with a time constant of 4 secs. [8+8]

2. (a) Explain the construction and working of an A.C. Tachometer generator. Describe its limitations.
   (b) Explain the construction, working of a photoelectric tachometer. Explain its advantages and disadvantages. [16]

3. Explain the transducers used for following temperature measurements.
   (a) Temperature of an oven having range of 0 to 1000^oC
   (b) Temperature of molten steel of -50^oC
   (c) Liquid at a temperature of -50^oC
   (d) Furnace having temperature range 0 *to* 1700^oC [4+4+4+4]

4. (a) Describe different sources of errors in U-tube manometer and how corrections can be applied to minimize these errors.
   (b) Explain how sensitivity can be increased by using inclined tube manometer. Describe its construction, advantages and limitations. [8+8]

5. (a) List out the advantages and limitations of direct method of level measurement.
   (b) Describe with neat sketch the functioning of any two types of displacer type liquid level measuring instruments. [16]

6. (a) How seismic instruments are used for measuring acceleration. Explain in detail.
   (b) What is the importance of humidity control in process industries? [8+4]

7. (a) Classify strain gauges.
   (b) Describe the method of surface preparation and bonding techniques while fixing strain gauge on a metallic member. [4+12]

8. Explain briefly the difference between.
   (a) open-loop and closed-loop control system.
   (b) positive and negative feed back.
   (c) servomechanism, process control and regulations. [16]

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Code No: RR321404 **Set No. 4**

III B.Tech II Semester Regular Examinations, Apr/May 2006
INSTRUMENTATION AND CONTROL SYSTEMS
(Mechatronics)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Explain briefly about the types of errors involved in measurement systems by giving suitable examples. Discuss the means adopted to reduce these errors. [16]

2. (a) Explain operation of ionization transducer with a neat sketch and write the applications.
   (b) Describe the construction and principle of
      i. LVDT
      ii. Variable reluctance displacement transducer. [16]

3. (a) Explain thermocouple protection materials and for what range they are used.
   (b) Explain the construction and working of
      i. Constant intensity optical pyrometer.
      ii. Variable intensity optical pyrometer.

   [12+4]

4. (a) With the aid of neat sketch, explain the working principle of dead - weight type tester.
   (b) Discuss various types of elastic pressure sensing elements used in electrical transducers. [16]

5. (a) List out the advantages and limitations of direct method of level measurement.
   (b) Describe with neat sketch the functioning of any two types of displacer type liquid level measuring instruments.

   [16]

6. (a) Compare the working of a servo and digital accelerometers.
   (b) Name the different types of hygrometers used for measuring humidity. [16]

7. (a) Draw any four types of strain gauge arrangement for measuring strain.
   (b) How resistive strain gauges are calibrated? [8+8]

8. Describe a typical close-loop control system that can be used in order to control the following processes:
   (a) the speed of a steam engine
   (b) the pressure in a furnace
   (c) the temperature of water being heated by steam and

(d) the speed of an automobile vehicle.

Draw the block diagram of the arrangement and mention the use of feed back in the application. [16]

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