Code No: R32034 **R10** **Set No: 1**

III B.Tech. II Semester Regular/Supplementary Examinations, May/June -2014

INSTRUMENTATION AND CONTROL SYSTEMS

(Common to Mechanical Engineering and Automobile Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Distinguish between the following
   i. Accuracy and Precision ii. Resolution and Threshold
   iii. Reproducibility and Repeatability iv. Dead zone and Hytersis
   (b) What is meant by calibration? Explain with suitable example and also mention the precautions while calibrating any instrument. [8+7]

2. (a) Describe the principle of operation of Piezo electric transducer. Identify the input and out put of the system.
   (b) Compare and contrast the advantages and limitations of resistance thermometers and thermistors. [8+7]

3. (a) Describe the construction and working of a Bourdon tube. Describe the C type, Spiral type and helical type Bourdon gauges with neat diagrams
   (b) A McLeod gauge having V=200cm^3 and a capillary diameter of 2 mm is used to measure the gas pressure. What will be the pressure of gas corresponding to a capillary reading of 4cm?
   (c) Explain the construction, working and theory of Ionization pressure gauges for measurement of pressure. [5+5+5]

4. Enumerate the principle of operation of the following: [15]
   (a) Capacitive level indicator (b) Ultrasonic level measuring instrument
   (c) Magnetic level indicator (d) Cryogenic fuel level indicator

5. (a) Describe the working principle of D.C.Tachometer generator and what are its advantages and disadvantages.
   (b) What are the advantages and disadvantages of centrifugal speed tachometer?
   (c) Explain the construction, principle of working and advantages of LVDT accelerometers. [5+5+5]

6. (a) List the main advantages of semiconductor strain gauges
   (b) Explain one method of temperature compensation using an adjacent arm compensating gauge.
   (c) Describe the working principle of strain gauge bridge with neat sketch. Indicate their arrangement for measurement of torque on a circular shaft. [5+5+5]

7. (a) sketch and explain the constructional details and working of a dew point meter
   (b) Explain the method of measuring force using a pneumatic load cell
   (c) Explain the construction and working of the Rope brake. [5+5+5]

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. [7+8]

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Code No: R32034 | R10 | Set No: 2

III B.Tech. II Semester Regular/Supplementary Examinations, May/June -2014

INSTRUMENTATION AND CONTROL SYSTEMS

(Common to Mechanical Engineering and Automobile Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) What you mean by function elements? Explain the division of a measurement system in to fractional elements with examples.
   (b) Discuss the necessity and importance of static performance of measuring systems [8+7]

2. (a) Briefly explain the following displacement transducers
   i. Capacitance transducers ii. Piezo electric transducers
   (b) Describe the working principle of total radiation pyrometers? List out its advantages and limitations. [8+7]

3. (a) Describe the construction and working of a Bourdon tube. Describe the C type, spiral type and helical type Bourdon gauges with neat diagrams.
   (b) Explain the working principle operation of Pirani gauge and also its limitations and merits.
   (c) Describe the application, advantages and limitations of elastic diaphragm gauges [5+5+5]

4. (a) With neat sketch describe the principle of operation, construction, advantages and limitations of Rotameter.
   (b) Explain the principle of hotwire anemometer. What are its merits and limitations? [8+7]

5. (a) Explain the measurement of vibration by the reed vibrometer and Stroboscope.
   (b) How seismic instruments used for measuring acceleration? Explain in detail. [8+7]

6. (a) A 150 Ω strain gauge is bonded to a steel bar which is subjected to a tensile load. Cross sectional area of the bar is $0.5x10^{-4}$ m^2 and E= 200GN/m^2.If load of 60kN produces a change of 1.5 Ω in the gauge resistance. Determine the gauge factor of the gauge.
   (b) What is the temperature compensation with respect to strain gauges?
   (c) How a Wheatstone bridge circuit is used for the measurement of strain. Explain the working of a null balance Wheatstone bridge circuit. [5+5+5]

7. (a) What are proving rings? Explain how they can be used for measurement of force using a vibrating reed and a micrometer.
   (b) Sketch and explain the constructional details and working of a dew point meter
   (c) What are driving dynamometers? With suitable diagrams, explain how a flash light torsion dynamometer works. [5+5+5]

8. (a) Describe a speed control system for controlling the speed of an IC engine
   (b) Draw a block diagram of the closed loop system considered above also explain why negative feedback is invariably preferred in such systems. [8+7]

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Code No: R32034 **R10** **Set No: 3**

III B.Tech. II Semester Regular/Supplementary Examinations, May/June -2014

INSTRUMENTATION AND CONTROL SYSTEMS

(Common to Mechanical Engineering and Automobile Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Draw a block diagram representation of a generalized measuring system identify the various elements and point out the function performed by each element
   (b) Give different types of errors occur during measurement with an instrument. Suggest methods to minimize the same. [8+7]

2. (a) Briefly explain the various types of working principle of photo electric transducers.
   (b) Briefly explain the different types of expansion thermometers
   (c) What are thermistors? Explain their different forms of construction and working principle of it. [5+5+5]

3. (a) List out the limitations of a McLeod vacuum gauge used to measure pressure
   (b) With the aid of neat sketch, explain the working principle of dead –weight type Tester.
   (c) Describe the application, advantages and limitations of elastic diaphragm gauges. [5+5+5]

4. Explain the working principle of following with suitable examples [4+4+4+3]
   (a).Ultrasonic level (b) Cryogenic fuel level indicator
   (c) Hot wire anemometer (d) Rotameter

5. (a) Explain the construction and theory of a moving magnet and moving coil type Transducer for measurement of linear velocity and explain its advantages.
   (b) Explain how a vibrometer is calibrated is calibrated to measure acceleration [8+7]

6. (a) Explain the function of a dummy gauge in a strain gauge load cell
   (b) List the procedure to mount a strain gauge with paper backing on the surface under study.
   (c) Explain the method of usage of resistance strain gauge for bending compressive and tensile strains. [5+5+5]

7. (a) What are the hygroscopic materials? Explain the working of any one of the absorption hygrometers.
   (b) Describe the working principle of hydraulic load cell.
   (c) Explain the construction and working of a eddy current brake. What are its advantages and limitations? [5+5+5]

8. (a) Briefly explain the different types of control systems.
   (b) Describe the working of one automatic control system used in practice, outline functional elements of that system. [8+7]

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Code No: R32034 | R10 | Set No: 4

III B.Tech. II Semester Regular/Supplementary Examinations, May/June -2014

INSTRUMENTATION AND CONTROL SYSTEMS

(Common to Mechanical Engineering and Automobile Engineering)

Time: 3 Hours **Max Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Distinguish between and give appropriate examples in each case:
   i. Range and span
   ii. Error and accuracy
   iii. Hystersis and dead zone
   iv. Threshold and resolution
   (b) Draw a block diagram representation of a generalized measuring system, identify the various elements and point out the function performed by each element. [8+7]

2. (a) Explain the following
   i. Inductive transducers ii. Resistance transducers
   (b) Explain the principle of working of thermocouples. State the law of intermediate temperatures and intermediate metals for thermocouples.
   (c) Describe the construction and working principle of optical pyrometer? List out the limitations and advantages. [5+5+5]

3. (a) Explain constructional details of McLeod pressure gauge.
   (b) list out the advantages and disadvantages of bellows over diaphragm gauges
   (c) Explain the construction, working and theory of thermal conductivity gauges for measurement of vacuum. Explain how radiation effects are minimized. [5+5+5]

4. (a) With neat sketch describe the principle of operation , construction , advantages and limitations of Rotameter.
   (b) Describe the working principle of Ultrasonic liquid level gauge. [8+7]

5. (a) sketch and explain working principle of eddy current tachometer
   (b) Explain the difference between a speed counter, tachoscope and tachometer
   (c) Explain how a vibrometer is calibrated to measure acceleration [5+5+5]

6. (a) Derive an expression for gauge factor resistance strain gauge
   (b) What are the requirements of a strain gauge
   (c) Briefly discuss on the surface preparation and bonding techniques for mounting bonded strain gauges. [5+5+5]

7. (a) What are the hygroscopic materials? Explain the working of any one of the absorption hygrometers.
(b) What are proving rings? Explain how they can be used for measurement of force using a vibrating reed and a micrometer.
(c) Explain the working principle of optical torsion meter. [5+5+5]

8. (a) With suitable examples, bring out the advantages of closed loop system over open loop system.
(b) Draw a block diagram of the closed loop system considered above. Also explain why negative feed back is invariably preferred in such systems. [8+7]

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