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

III B.Tech. II Semester Regular Examinations, April/May -2013

INSTRUMENTATION & CONTROL SYSTEMS

(Mechanical Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Distinguish between accuracy and Precision. Which of these is more desirable during the act of measurement and why?
   (b) Discuss the necessity and importance of dynamic performance of measuring systems. [5+10M]

2. (a) Explain the principle of working of thermocouples. State the law of intermediate temperatures and intermediate metals for thermocouples
   (b) Explain how displacement can be measured with the help of an inductive and capacitive transducer. Give the essential features of construction of these two types of electrical transducer. [8+7M]

3. (a) Sketch a McLeod gauge and explain its construction and working principles. mention its limitations and applications.
   (b) Explain the working principle of Pirani thermal conductivity gauge [8+7M]

4. (a) Enumerate the principle of operation of the following:
   i. Capacitive level indicator **ii**. Ultrasonic level measuring instrument
   (b) Enumerate the principle of operation, construction details, advantages and limitations of Rotameter. [8+7M]

5. (a) What is a seismic type velocity transducer? Explain its construction with the help of a neat diagram.
   How can it be used for measurement of acceleration in vibration measurements? Explain
   (b) Describe the working principle of Fly ball tachometer [8+7M]

6. (a) Briefly discuss on the surface preparation and bonding techniques for mounting bonded strain gauges.
   (b) Differentiate the n-type and p-type sensing elements of a semiconductor strain gauge.
   (c) Derive an expression for gauge factor resistance strain gauge [4+4+7M]

7. (a) How relative humidity is measured using hygrometer?
   (b) With neat sketch explain the working principle of Strain gauge load cell. [8+7M]

8. (a) Explain the working of a system used for automatic control of temperature of a room.
   (b) Distinguish between open control and closed loop control. [9+6m]

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Code No: R32034 **R10** **Set No: 2**

III B.Tech. II Semester Regular Examinations, April/May -2013

INSTRUMENTATION & CONTROL SYSTEMS

(Mechanical 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) Distinguish the following [7+8M]
   (i) Speed of response and measuring lag (ii) Fidelity and overshoot
   (iii) Dead time and dead zone
   (iv) Precision and accuracy

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

3. (a) Explain how the operational errors of the Bourdon tubes gauge can be reduced?
   (b) Explain the bellows arrangement used to measure gauge & differential pressure gauge.
   (c) How can a strain gauge be used to measure pressure with the help of flattened tube pressure cell? [5+5+5M]

4. (a) Describe the working of a cryogenic fuel level indicator. What are its advantages and limitations? [8+7M]
   (b) Explain the principle of hotwire anemometer. What are its merits and limitations?

5. (a) Name different electrical non-contact tachometers. Explain with neat diagram, working of an inductive pick up tachometer.
   (b) What are the advantages of piezoelectric type accelerometer? [8+7M]

6. (a) List out the properties of materials used for strain gauges.
   (b) Discuss the null mode of a wheat stone bridge circuit used for strain measurement.
   (c) What do you understand by a strain rosette? How is it used. [4+7+4M]

7. (a) Describe with neat sketch, explain the working principle of Sling hygrometer.
   (b) With neat sketch explain the working principle of Proving ring. [8+7M]

8. (a) Explain the following
   (i). Position control(**ii)**. Velocity control (**iii)**. Acceleration control
   (b) How water level in a boiler is controlled? [8+7M]

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

III B.Tech. II Semester Regular Examinations, April/May -2013

INSTRUMENTATION & CONTROL SYSTEMS

(Mechanical Engineering)

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

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) What are the different types of dynamic inputs? Explain them with neat sketches
   (b) Give different types of errors occur during measurement with an instrument. Suggest methods to minimize the same. [8+7M]

2. (a) Explain the difference in the principle of operation of a Photo emissive cell, a Photo conductive cell and a Photo voltaic cell.
   (b) Enumerate the sources of errors in thermocouples and explain how they are prevented. [8+7M]

3. (a) Explain the construction, working and theory of thermal conductivity gauges for measurement of vacuum. Explain how radiation effects are minimized.
   (b) Explain how sensitivity can be increased by using inclined tube manometer. Describe its construction theory, advantages and limitations.
   (c) List out the limitations of a McLeod vacuum gauge used to measure pressure. [8+4+3M]

4. (a) Explain the principle of operation of a Rotameter. What are its limitations.
   (b) With neat diagram, explain the working principle of Magnetic level indicator and Cryogenic fuel level indicator. [8+7M]

5. (a) Describe the functioning of a stroboscope and describe and explain how speed of a rotating shaft can be measured using a single pattern and multi pattern disc?
   (b) How seismic instruments used for measuring acceleration? Explain in detail. [8+7M]

6. (a) List the procedure to mount a strain gauge with paper backing on the surface under study.
   (b) An electric resistance strain gauge of 100 resistance and gauge factor 2 is bonded to a specimen of steel. Calculate the change in resistance of the gauge when a tensile stress of 60 MN/m^2 is applied on the specimen.
   (c) How a Wheatstone bridge circuit is used for the measurement of strain? Explain the working of a null balance Wheatstone bridge circuit. [4+4+7M]

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7. (a) Sketch and explain the constructional details and working of a dew point meter.
   (b) Explain the construction and working of hydraulic load cells. Discuss their advantages and disadvantages. [8+7M]

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. [6+9M]

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Code No: R32034 **R10** **Set No: 4**

III B.Tech. II Semester Regular Examinations, April/May -2013

INSTRUMENTATION & CONTROL SYSTEMS

(Mechanical 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+7M]

2. (a) Sketch a typical radiation pyrometer, explain its working and list its noticeable characteristics

   (b) Give the essential features of inductive and ionization transducers when used for measurement of displacement.

   (c) List out the advantages and limitations of capacitive transducer. [8+7M]

3. (a) Describe the construction, working of a Dead Weight Tester. What are the factors effecting the accuracy of dead weight testers?

   (b) Explain the working principle of Ionization gauge [8+7M]

4. (a) Explain the Ultrasonic flow meter using travel time difference and oscillating loop method. [8+7M]

   (b) What is Flow visualization? Describe the construction and working of a Laser Doppler Anemometer (LDA). What are its advantages and its limitations?

5. (a) Name different electrical non-contact tachometers. Explain with neat diagram, working of an inductive pick up tachometer.

   (b) Explain the principle of seismic instrument. Derive an expression to measure velocity and acceleration using this instrument. [8+7M]

6. (a) What is the purpose of providing baking for bonded strain gauges?

   (b) An electric resistance strain gauge of 100 resistance and gauge factor 2 is bonded to a specimen of steel. Calculate the change in resistance of the gauge when a tensile stress of 60 MN/m^2 is applied on the specimen.

   (c) Explain one method of temperature compensation using an adjacent arm compensating gauge. [4+4+7M]

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7. (a) What are proving rings? Explain how they can be used for measurement of force using a vibrating reed and a micrometer. [8+7M]
   (b) Sketch and explain the constructional details and working of a dew point meter.

8. (a) Distinguish between Manual control system and Automatic control systems.
   (b) Identify the components, input and output and describe the operation of a biological control system consisting of a human being reaching the push button of an electric bell.
   [5+10M]

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