

Code No: 07A70304

**R07****Set No. 2**

**IV B.Tech I Semester Examinations, December 2011  
INSTRUMENTATION AND CONTROL SYSTEMS**

**Common to Mechanical Engineering, Automobile Engineering**

Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions  
All Questions carry equal marks**

\*\*\*\*\*

1. (a) How absolute humidity is measured?  
(b) What are load cells? Name the application of load cells. [10+6]
2. (a) What is the basic principle in thermal conductivity gauge? Explain the working principle of thermal couple type conductivity gauge.  
(b) A McLeod gauge having  $V = 200\text{cm}^3$  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? [10+6]
3. Describe in detail with neat sketches.  
(a) Float operated Rheostat  
(b) Hook Level indicator  
(c) Turbine flow meter. [4+6+6]
4. (a) Distinguish between RTD and thermistors.  
(b) State the laws of thermocouples. How are the laws useful in construction of thermocouple thermometers? [6+10]
5. (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]
6. (a) What is the temperature compensation with respect to strain gauges?  
(b) Explain how an unbonded strain gauge is used to measure strain?  
(c) List the essential characteristics required for the backing material of a bonded strain gauge. [6+6+4]
7. Explain the dynamic response characteristics of first order instruments to step, ramp and sinusoidal inputs. [16]
8. 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. [16]

\*\*\*\*\*

Code No: 07A70304

**R07****Set No. 4**

**IV B.Tech I Semester Examinations, December 2011  
INSTRUMENTATION AND CONTROL SYSTEMS**

**Common to Mechanical Engineering, Automobile Engineering**

Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions  
All Questions carry equal marks**

\*\*\*\*\*

1. (a) By means of neat sketches, explain the working of a RTD thermometer. Why protection is needed for the sensing element?  
(b) Explain by means of neat sketches, the working of thermocouples. What is ambient temperature compensation? [8+8]
2. (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 gauges. [3+3+10]
3. (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]
4. (a) How does a mechanical load cell work ? Explain the principle of measuring shaft torque using strain gauge torsion meter.  
(b) How is dew point temperature measured? [8+8]
5. (a) Explain the working of elementary accelerometers like
  - i. Vibrating wedge
  - ii. Cantilever.
 Describe how vibrations are measured by each  
(b) Explain the construction, principle of working and advantages of Capacitance vibration sensor accelerometers. [10+6]
6. Explain in detail with neat sketches.
  - (a) Liquid level measurement using Capacitive transducer
  - (b) Sight glass level indicator
  - (c) Bubbler level indicator. [6+4+6]
7. (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]

Code No: 07A70304

**R07**

**Set No. 4**

8. (a) Describe the construction of a U tube Manometer and explain how it can be used for measurement of absolute gauge and differential pressures. Describe the different sources of errors and how corrections can be applied to minimize these errors.
- (b) A U tube has its right limb open to atmosphere. The left limb is full of water and it connected to a pipe containing water under pressure. The center of which is in level with the free surface of mercury. Find the pressure of the water in the pipe above atmosphere if the difference in levels of mercury in the limbs is 5.08cm. [10+6]

\*\*\*\*\*

JNTUWORLD

Code No: 07A70304

**R07****Set No. 1**

**IV B.Tech I Semester Examinations, December 2011  
INSTRUMENTATION AND CONTROL SYSTEMS**

**Common to Mechanical Engineering, Automobile Engineering**

Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions  
All Questions carry equal marks**

\*\*\*\*\*

1. (a) What is meant by Tachometer?  
(b) With neat sketch explain the working principles of Revolution counter and Tachoscope tachometers.  
(c) List out the advantages of Hand speed indicator over centrifugal speed indicator. [2+10+4]
2. (a) What is a servo mechanism? Explain  
(b) Describe the operation of a driver driving an automobile on the road and identify the components, input and output of the human system. [8+8]
3. (a) Classify measuring instruments.  
(b) What are desired, modifying and interfering inputs for a measurement system? Give examples for each of these quantities. What is the influence of these on the final output? [6+10]
4. (a) What are the driving dynamometers? Explain any one of them.  
(b) With neat sketch, explain the working principle of Mechanical humidity sensing absorption hygrometer. [8+8]
5. (a) Enumerate the principle of operation, construction details, advantages and limitations of Rotameter.  
(b) List out the advantages and disadvantages of In direct method level measurement. [12+4]
6. (a) Explain the working of Liquid in glass thermometers by means of neat sketches. List their advantages and disadvantages.  
(b) Temperature of flue gases as they leave a chimney of 20m height is to be monitored. Suggest a suitable thermometer and explain its working. How is ambient temperature correction provided to the instrument? [8+8]
7. (a) How do you measure the pressure with the help of U-tube manometer and Micro manometer.  
(b) Explain the working principle of Pirani thermal conductivity gage [8+8]
8. (a) Four strain gauges are mounted on a test specimen of steel subjected to a tensile load. Show the arrangement of gauges on the test specimen and also in the bridge.

Code No: 07A70304

**R07**

**Set No. 1**

- (b) A  $200 \Omega$  strain gauge is bonded to a steel bar which is subjected to a tensile load. Cross sectional area of the bar is  $0.8 \times 10^{-4} m^2$  and  $E = 200 GN/m^2$ . If load of 70 kN produces a change of  $1.6 \Omega$  in the gauge resistance. Determine the gauge factor of the gauge. [8+8]

\*\*\*\*\*

JNTUWORLD

Code No: 07A70304

**R07****Set No. 3**

**IV B.Tech I Semester Examinations, December 2011  
INSTRUMENTATION AND CONTROL SYSTEMS**

**Common to Mechanical Engineering, Automobile Engineering**

Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions  
All Questions carry equal marks**

\*\*\*\*\*

1. Explain the working principle of
  - (a) Ionization gauge and
  - (b) Knudsen gauge. [8+8]
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 of linear and angular displacement. [4+12]
3. (a) Suggest a simple control system which automatically turns on a room lamp at dusk and turn it off in day light . Draw the schematics and block diagram of the suggested control system.  
 (b) Distinguish between:
  - i. Position control
  - ii. Acceleration control. [8+8]
4. (a) Differentiate between accuracy and precision.  
 (b) How do second order instruments respond to ramp input? [6+10]
5. (a) Explain the principle of working of load cell using strain gauges.  
 (b) Explain basic principle of Pendulum scale and Weight beam type device. [8+8]
6. (a) Describe the advantageous of Semiconductor type Strain gauge over the other types.  
 (b) Describe the salient features of a semiconductor type strain gauge.  
 (c) Explain the two arm and four arm conditions used for strain measurement. [4+4+8]
7. (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]
8. Explain the working principle of non-contact type of a Electrical tachometers. [16]

\*\*\*\*\*