

II B.Tech II Semester Supplementary Examinations, Apr/May 2008
INSTRUMENTATION AND CONTROL SYSTEMS
(Common to Mechanical Engineering, Production Engineering and
Automobile Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Discuss briefly on the reliability of measurement systems. Explain how reliability improvement can be achieved.
(b) "A precise instrument need not be accurate" explain. [8+8]
2. (a) Give the classification of inductive transducers indicating their principle.
(b) Describe in detail the construction and working of an inductive and a capacitive transducers to measure linear displacement. [6+10]
3. With neat diagrams explain the construction, working principle of different types of pressure thermometers, compare them. [16]
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) Explain the principle of a hydrometer.
(b) What is a vibrometer? Explain any one of them. [16]
7. (a) Describe the properties of materials used for strain gauges.
(b) Draw a simple strain gauge element and mark active and inactive direction
(c) Explain the two arm and four arm conditions used for strain measurement. [4+4+8]
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+8]

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1. (a) What do you mean by the term calibration ? Explain it.
(b) Explain the following terms:
 - i. Speed of response
 - ii. Sensitivity
 - iii. Dead time
 - iv. Dead Zone

[8+8]
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. What are the types of pyrometers? Explain any one of them in detail with a neat diagram.

[16]
4. (a) Describe the reasons for the popularity of the Bourdon tube element for pressure measurement and show how the elements are constructed.
(b) Describe the constructional features of
 - i. Bellow type gauges
 - ii. Diaphragm types gauges and show how their output signals are processing for indication.

[8+8]
5. (a) With neat sketch describe the principle of operation, construction, advantages and limitations of rotameter.
(b) Explain the working of vane type flow meter.

[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+8]
7. (a) Describe the properties of materials used for strain gauges.
(b) Draw a simple strain gauge element and mark active and inactive direction
(c) Explain the two arm and four arm conditions used for strain measurement.

[4+4+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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1. (a) What do you mean by instrumentation? Write the objectives of instrumentation.
(b) State and explain the desirable static and dynamic characteristics of an instrument. [16]
2. (a) Describe the function of a stroboscope and explain how speed of a rotating shaft can be measured by single pattern and multi pattern disc.
(b) Draw a neat sketch of non-contacting optical tachometer; explain the working principle of tachometer. [16]
3. (a) With necessary diagram explain the various methods employed in cold junction compensation.
(b) What are various materials used for Thermo couples? [8+8]
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. Explain the principle of operations of
(a) Hot wire anemometer.
(b) Turbine meter for the measurement of Fluid velocity. [16]
6. (a) What are the advantages of piezoelectric type accelerometer?
(b) Name the different vibration sensing systems used in practice. Explain any one such system for the measurement of vibration. [8+8]
7. (a) Write the desirable characteristics of bonding material.
(b) Explain how the strain gauge functions as transducer as deflection and measurement of elastic deformation. [4+12]
8. (a) Distinguish between open and closed loop systems. Explain with suitable examples.
(b) How water level in a boiler is controlled? [12+4]

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1. Explain the various physical principles involved in the operation of various categories of inductive transducers. [16]
2. (a) List the different types of speed-measuring devices. Explain with neat sketches, the construction and working of any two of them.
(b) Write short note on the Tachogenerators. [8+8]
3. (a) Explain the construction and working principle of liquid-in-glass thermometer.
(b) With neat diagram explain the construction and working principle of vapour pressure thermometer. [4+12]
4. (a) Sketch the pirani-type thermal conductivity gauge, explain its operation.
(b) Explain limitations and merits of pirani gauge. [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) 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) Draw any four types of strain gauge arrangement for measuring strain.
(b) How resistive strain gauges are calibrated? [8+8]
8. (a) A computer controlled fuel injection system that automatically adjusts the fuel-air mixture ratio could improve gas mileage and reduce unwanted polluting emissions significantly. Sketch a block diagram for such a system for an automobile and explain its working.
(b) Explain with the help of a block diagram the working of the variable speed dc drive control system. State its characteristic and applications. [16]
