

Code No: R32034

**R10****Set No: 1**

III B.Tech. II Semester Supplementary Examinations, January -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) Describe the significance of measurements. How are standards of measurement classified?  
b) What is an Error calibration curve? Explain percentage relative error?
2. a) What is a function of a transducer in an electronic instrumentation system?  
b) Explain resistance thermometer bulb with a neat sketch.
3. A McLeod gauge has a capacity of 1mm diameter and a bulb of 100 c.c. Calculate the pressure indicated by a reading of 20 mm. What error would result in the measurement if the volume of capillary is dropped in comparison with the volume of the bulb?
4. a) Explain briefly the electrical level gauge principle.  
b) Explain electrical methods of viscosity measurement.
5. Explain the working of centrifugal tachometer with a neat sketch. What are the causes of vibrations in machines?
6. A strain gauge of 120 resistance and a gauge factor 2.0 is used in a strain gauge potentiometric circuit. The current flow through the system, when working under maximum sensitivity conditions, is limited to 20 mA. Calculate the following when a strain 500 micro-strain is impressed upon the gauge:  
(i) The input/supply voltage. (ii) The change in output voltage.
7. Explain the working of Prony brake dynamometer with a neat sketch.
8. a) Explain Servo mechanism?  
b) Draw and explain the block diagram of the feed backcontrol system.

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1. a) What are primary, secondary and tertiary measurements? Explain with examples.  
b) What are gross errors? How can these be avoided?
2. In a linear voltage differential transformer the output voltage is 2.0V at maximum displacement. At a certain load the deviation from linearity is maximum and it is  $\pm$  from a straight line through origin. Find the linearity at the given load.
3. How are high pressures measured? Explain briefly with a neat sketch and construction and working of a Baridgman gauge used for measuring high pressures?
4. a) Explain Bubbler level indicator with a neat sketch.  
b) Explain Hot –Wire anemometer with a neat sketch.
5. a) Explain gravity balance method and strain gauge torsion meter.  
b) Explain the working of a Dew point recorder with a sketch.
6. A strain gauge ( $G_f = 2.0$ ) has been applied a tensile strain of 0.001. The value of the gauge resistance and each of the other three resistances comprising the limbs of a wheat stone bridge circuit is 120. Calculate the following.
  - (i) Change in the value of variable  $R_3$  to rebalance null- type bridge
  - (ii) Output voltage of a voltage sensitive bridge if the voltmeter resistance is very high and input voltage is 6V.
7. a) Explain Resistive hygrometer with a neat sketch.  
b) Explain Eddy current dynamometer with a neat sketch.
8. a) Differentiate between open loop and closed loop system.  
b) Explain automatic control system. List its advantages and disadvantages.

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1. Explain generalized description of a measuring system with a block diagram.
2. a) Explain Linear –Variable-Differential Transformer transducers with a neat sketch.  
b) State the advantages and disadvantages of thermocouples.
3. Describe briefly the construction and working and theory of a McLeod gauge for measurement of vacuum. List its advantages and disadvantages.
4. Water flows in a tube of 25 mm diameter at 3 m/sec. Assuming one dimensional frictionless flow calculate the velocity measured by a 12 mm diameter Pitot static tube. What diameter Pitot static tube should be used to reduce this error to 1% ?
5. a) Explain Proving Rings with a sketch.  
b) Explain Electromagnetic relative vibration pick-up with a neat sketch.
6. A strain gauge having a resistance of 120 and gauge factor of 2.0 is mounted on a steel bar it forms one arm of a symmetrical Wheatstone bridge circuit. When a tensile load applied on the bar, the galvanometer shows output voltage equivalent to 5mV. If the operating current is 15mA calculate the mechanical strain developed in the bar.
7. a) Explain hydraulic load cell and strain gauge load cell.  
b) Explain gravity balance method and strain gauge torsion meter.
8. a) Explain micro controller with a simplified block diagram.  
b) Explain hydraulic control system with a neat sketch.

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1. Explain the following terms :
  - a) Static error, b) Static correction, c) Relative error.
2. (a) What is a piezo electric-transducer? List the advantages and disadvantages of piezo-electric transducers.  
(b) Explain resistance thermometer bulb with a neat sketch.
3. Draw diagrams to show how LVDTs can be used with bellows, elements and bourdon tubes for measurement of pressure? Give their advantages and disadvantages?
4. (a) Explain the following methods of viscosity measurement?  
(b) Rotating cylinder method b) Falling sphere method and C) Capillary tube method.
5. (a) Explain stroboscopic tachometers with a sketch.  
(b) Explain Seismic accelerometer with a sketch.
6. A strain gauge of 140 resistance and a gauge factor 2.0 is used in a strain gauge potentiometric circuit. The current flow through the system, when working under maximum sensitivity conditions, is limited to 30 mA. Calculate the following when a strain 600 micro-strain is impressed upon the gauge:
  - (i) The input/supply voltage.
  - (ii) The change in output voltage.
7. A strain gauge having a resistance of  $120\Omega$  and gauge factor of 2.0 is mounted on a steel bar; it forms one arm of a symmetrical wheatstone bridge circuit. When a tensile load is applied on the bar, the galvanometer shows output voltage equivalent to 5mV. If the operating current is 15mA. Calculate the mechanical strain developed in the bar.
8. a) Draw and explain the block diagram of the feed back control system.  
b) Explain hydraulic control system with a neat sketch.

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