

Code No: RT31034

**R13****SET - 1**

**III B. Tech I Semester Supplementary Examinations, May – 2016**  
**INSTRUMENTATION & CONTROL SYSTEMS**  
(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
2. Answering the question in **Part-A** is compulsory  
3. Answer any **THREE** Questions from **Part-B**

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**PART -A**

- 1 a) Explain system response system and distortion. [3M]
- b) Explain the theory of radiation pyrometers. [4M]
- c) What are the advantages of raised well manometers? [4M]
- d) What is flow visualization? [3M]
- e) Explain ballast circuit with a sketch. [4M]
- f) What is the difference between open loop and closed loop system? [4M]

**PART -B**

- 2 a) Explain dynamic response of second order instrument. [4M]
- b) A resistor has a nominal value of  $10\ \Omega \pm 1\%$ . A voltage is applied across the resistor and calculates the power consumed in the resistor. Calculate the uncertainty in each case when the measured values of  $E$  and  $I$  are :  
 $E = 100\text{ V} \pm 1\%$  and  $I = 10\text{ A} \pm 1\%$  [8M]
- c) Explain the experimental determination of system parameters. [4M]
- 3 a) Describe the series and parallel connections of thermocouple and where it is used? [3M]
- b) A McLeod gauge is available with bulb and measuring capillary volume of  $150 \times 10^6\text{ mm}^3$  and a capillary of diameter  $0.3\text{ mm}$ . Calculate the gauge reading for a pressure of  $30\ \mu\text{m}$ . [8M]
- c) Explain electrical resistance thermometers and resistance thermometer detector. [5M]
- 4 a) Explain different types of flow obstruction methods. [6M]
- b) A seismic accelerometer sensing displacement has an undamped frequency of  $20\text{ Hz}$  and a damping ratio of  $0.7$ . Calculate a) its damped frequency b) the amplitude ratio and phase angle between the motion of the seismic mass and the applied vibration if the latter is a sinusoidal displacement at a frequency of  $30\text{ Hz}$  and  $1\text{ kHz}$ . [8M]
- 5 a) Explain the working mechanical tachometer with a neat sketch. [8M]
- b) A piezoelectric accelerometer has a transfer function of  $61\text{ mV/g}$  and a natural frequency of  $4500\text{ Hz}$ . In a vibration test at  $110\text{ Hz}$ , a reading of  $3.6\text{ V}$  peak is obtained. Find the vibration peak of displacement? [8M]
- 6 a) Explain the method of calibration of strain gauges. [8M]
- b) Explain the bridge circuit along with an operational amplifier for measurement of strain. [8M]
- 7 a) Describe servo mechanism. Draw block diagram of a servo mechanism. [8M]
- b) Draw and explain the closed loop control systems? What are the advantages of it? [8M]

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