

**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**

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|---|---|------|
| 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**

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|---|--|------|
| 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 :<br>$E = 100 \text{ V} \pm 1\%$ 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 $150 \times 10^6 \text{ mm}^2$ and a capillary of diameter 0.3 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 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 Hz and 1 kHz. | [8M] |
| 5 | a) Explain the working mechanical tachometer with a neat sketch.   | [8M] |
|   | b) A piezoelectric accelerometer has a transfer function of 61 mV/g and a natural frequency of 4500 Hz. In a vibration test at 110 Hz, a reading of 3.6 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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