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Total number of printed pages – 2

B. Tech  
CPME6403

**Seventh Semester (Special) Examination – 2013**

**MECHANICAL MEASUREMENT AND CONTROL**

**BRANCH : MECH**

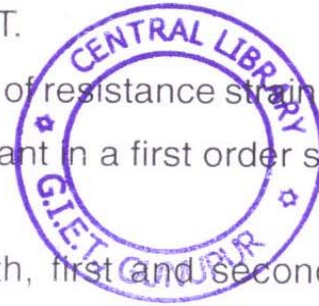
**QUESTION CODE : D 451**

**Full Marks – 70**

**Time : 3 Hours**

*Answer Question No. 1 which is compulsory and any **five** from the rest.  
The figures in the right-hand margin indicate marks.*

1. Answer the following questions : 2×10
- (a) What do you mean by loading error in measurement systems ?
  - (b) Why is calibration of instruments necessary ?
  - (c) Why intermediate modifying systems are required ?
  - (d) What is temperature compensation in strain measurement ?
  - (e) Mention the basic principle of LVDT.
  - (f) What do you mean by gage factor of resistance strain gage ?
  - (g) What do you mean by time constant in a first order system ? What is its significance?
  - (h) Give suitable examples of zeroth, first and second order measuring systems.
  - (i) What are the different inputs usually considered for transient analysis of control system ?
  - (j) Name the various devices used for dimensional measurements.
2. What are the three stages of measurement system ? With an example, explain each stage through diagrams. 10



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3. Explain the principle of variable area meters for flow measurement. With a neat sketch, describe the construction and working of a rotameter along with its advantages and disadvantages. 10
4. (a) A resistance strain gage with a gage factor of 2 is cemented to a steel member, which is subjected to a strain of  $1 \times 10^{-6}$ . If the original resistance value of the gage is  $130 \Omega$ , calculate the change in resistance. 5
- (b) A simple ballast circuit is used to measure the output of a pressure pickup. The circuit is designed so that the internal resistance is six times the total transducer resistance. A source of 100V is used to energize the circuit. Calculate the voltage output at 25, 50, 60 and 80 percent full load on the transducer. 5
5. (a) Explain the theory and construction of Bimetallic thermometers. What are the commonly used metals? 5
- (b) With a neat sketch describe accelerometer. 5
6. (a) How the calibrations of flow measurement devices are carried out? 3
- (b) Explain the term Pyrometry. With a neat sketch, explain the principle of working of an optical Pyrometer. 7
7. The open loop transfer function is given as  $G(s) = \frac{4S^2 + S + 10}{S(S+5)(S+2)}$ , and feedback  $H(S)=1$ . Determine the unit step transient response, maximum overshoot and settling time (5%) 10
8. (a) Explain Routh criterion for stability. 3
- (b) Determine the range of K for which the following unity feedback system will be stable. 7

$$G(s) = \frac{K}{S(S+1)(S+2)}$$

