Registration No. : | | | | | | | | | | |

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

P.T.O.

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 1×10^{-6}. If the original resistance value of the gage is 130 Ω, 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

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