**B.E. 6th Semester (Mech. Engg.) Examination, May–2013**

**MEASUREMENT AND INSTRUMENTATION**

**Paper–ME-310-E**

*Time allowed : 3 hours]* *[Maximum marks : 100*

***Note :*** *Students are required to attempt any five questions.*

1. (a) What are the major elements of a measurement system ? Distinguish between Intelligent Instrumentation Systems and Dumb Instrumentation systems. Cite examples to support your answer. 10

   (b) Discuss standards and calibration in detail. 10

2. (a) Explain why is it necessary to introduce terms Static Stiffness and Static Compliance in addition to Static Impedance and Static Admittance for analysis of loading effects in a generalized measurement system. 10

   (b) Derive the transfer function of a thermal system when the heat input rate is suddenly increased from its steady conditions. Also discuss the assumptions made. 10

3. (a) A capacitive transducer is made up of two concentric cylindrical electrodes. The outer diameter of the inner cylindrical electrode is 3 mm and dielectric medium is air. The inner diameter of the outer electrode is 3.1 mm. Calculate the dielectric stress when a voltage of 100 V is applied across the electrode. Is it within safe limits ? The length of electrodes is 20 mm. calculate the change in capacitance if the inner electrode is moved through a distance of 2 mm. The breakdown strength of air is 3 KV/mm. 10

(b) Describe the working and properties of materials used for piezo-electric transducers. Derive expressions for voltage and charge sensitivities. 10

4. (a) What is amplitude modulation ? Also explain the classification of filters. 10

(b) Explain the working of an integrating type of digital voltmeter and magnetic type recorder. 10

5. (a) What are load cells ? Discuss types and working of a load cell using strain gauges. 10

(b) Describe an overall view of different methods of measuring torque of rotating shafts. What are sources and sinks ? 10

6. (a) Explain how sensitivity can be increased by using inclined tube manometer. Describe its construction, theory, advantages and limitations. 10

(b) Describe construction and working of an Electromagnetic flow meter. Also discuss its advantages and disadvantages. 10

7. (a) Explain the theory of radiation pyrometers. Describe the different receiving elements. 10

(b) Describe the construction and working of thermocouples. Describe the thermo electric laws and their applications. 10

8. (a) Define precision index, probable error and standard deviation of mean for Gaussian distribution of data. 10

(b) Explain the method of treatment of single sample data with the help of uncertainty analysis by giving suitable examples. Also define uncertainty distribution, mean value and odds. 10