Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech(ME)/SEM-1/ME-103/2009-10

2009

SENSORS & ACTUATORS

Time Allotted : 3 Hours Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer any *five* questions taking at least two from each group.

GROUP – A

1. a) What are the principle components which determine the operating characteristics of strain gauge ? What is the gauge length of strain gauge ? 3 + 1

   b) Derive the gauge factor in terms of Poissons ratio in case of the semiconductor type strain gauge. 5

   c) Describe the different Wheatstone bridge connection used in strain gauge measurement. Which one is more advantageous and why ? 3 + 2

2. a) Explain with neat diagram the contraction and operating principle of LVDT. Explain two different applications of LVDT with sketch. 4 + 4

   b) Explain the working principle of Rotary optical shaft encoder. How are they classified ? Why is the gray code more commonly adopted approach in counting and recording by encoder ? 4 + 1 + 1

3. a) Describe the constructional features, design aspects and working principle of diaphragm type pressure transducer. 8

   b) Explain how diaphragm be adopted to capacitance type and inductive type pressure transducer. 3 + 3

4. Write short notes on any *three* of the following : 14

   a) Hall sensors

   b) Capacitive proximity sensors

   c) Tachogenerator

   d) Potentiometric transducer.

GROUP – B

5. a) With neat diagrams, explain the construction and basic principle of different types of restriction type flowmeters. 10

   b) Describe different tapping design of restriction type flow meter. 4

6. a) Explain the construction and working principle of Coriolis type mass flowmeter. 7

   b) What is the operating principle of magnetic flowmeter ? Deserибe with sketch. Why we prefer *D.C.* excitation imtead of *A.C.* in case of magnetic flowmeter ? 4 + 3

7. a) Describe different types of electrical motors used as actuators in control system. 5

   b) What are the main difference between brushless *D.C.* motor and conventional *D.C.* motor ? 2

   c) What is the resolution of stepper motor ? Describe with neat sketch, the operation of stepper motor. 2 + 5

8. Wrrite short notes on any *three* of the following : 14

a) Linear motor

b) Turbine motor

c) Ultrasonic flowmeter

d) Single-phase motor.