



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.

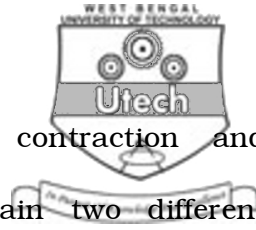
Answer any *five* questions taking at least two from each group.

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

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2. a) Explain with neat diagram the construction 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 ? Describe with sketch. Why we prefer *D.C.* excitation instead 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

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



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- a) Linear motor
 - b) Turbine motor
 - c) Ultrasonic flowmeter
 - d) Single-phase motor.
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