A 1390

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Seventh Semester

Mechanical Engineering

ME 433 — MECHATRONICS

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the elements of measurement system? Show them with the help of block diagram.

2. What is the function of a control element in the closed-loop system?

3. What do you mean by repeatability and stability of a transducer?

4. What is Hall Effect? Explain.

5. What is the role of status register in a microprocessor?

6. What do you mean by serial and parallel data transfer?

7. What are the criteria that need to be considered for selecting a PLC?

8. Draw the ladder rungs to represent : two switches are normally open and both have to be closed for a motor to operate.

9. Differentiate between traditional and machatronics designs with an example.

10. How a cam operated switch is replaced with PLC? Show the ladder diagram.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Distinguish between open and closed loop systems with an example. (6)

(ii) State steps that might be present in the sequential control of a dishwasher. (10)

Or

(b) (i) Identify the sensor, signal conditioner and display elements in the measurement systems of

(1) a mercury-in-glass thermometer

(2) a Bourdon pressure gauge. (3 + 3)

(ii) Compare and contrast control system for the domestic central heating system involving a bimetallic thermostat and that involving a microprocessor. (10)

12. (a) Explain the working principle of following sensors with neat sketches.

(i) Pneumatic sensors.

(ii) Proximity switches. (8 + 8)

Or

(b) (i) What are the factors to be considered for selecting a sensor? Explain. (8)

(ii) Explain the dynamic characteristics of a sensor. (8)

13. (a) (i) How does a micro controller differ from a micro processor? (4)

(ii) Draw a block diagram of a basic micro controller and explain the function of each subsystem. (12)

Or

(b) Draw the block diagram of 8085 micro processor and explain the function of each element. (16)

14. (a) (i) Device a circuit that could be used with a domestic washing machine to switch on a pump to pump water for 100s into the machine, then switch off and switch on a heater for 50s to heat the water. The heater is then switched off and another pump is to empty the water from the machine for 100s. (8)

(ii) Explain how a PLC can be used for data movement and data comparison. (8)

Or

(b) (i) Explain how a counter can be used in PLC's. (8)

(ii) Discuss the use of Internal relays in PLC. (8)

15. (a) (i) What are the stages in designing Mechatronics systems? (8)

(ii) With a suitable example, distinguish between traditional and mechatronic design. (8)

Or

(b) Discuss the mechatronic design of a pick-and-place robot. (16)
