R 8499

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006.

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 constituent elements of measurement systems?

2. List out the basic elements of closed-loop system.

3. Define the range and the span of a transducer.

4. What is an encoder?

5. What is ALU in a microprocessor and its function?

6. What is the function of the stack pointer register?

7. Mention the two specific features of PLCs.

8. What is latching in PLCs?

9. State the function of counter.

10. Automatic camera is a mechatronics system – Justify.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Briefly explain any two Mechatronics system with examples. (8)

(ii) Explain the following terms :

Sensitivity, Hysteresis error, Stability and resolution. (8)

Or

(b) (i) Describe the rotary type potentiometer. (8)

(ii) How is the capacitance measurement used for displacement? (8)

12. (a) Explain the working principle of following sensors :

(i) Piezoelectric sensors (8)

(ii) Thermocouples. (8)

Or

(b) Two cylindrical parts of different heights are produced and made to move in a conveyor and randomly placed. Tolerance in height is specified for both the parts. Give the schematic diagram for measuring the height of both the parts and counting them by choosing the proper sensors. (16)

13. (a) What are the common types of registers of microprocessor and explain them. (16)

Or

(b) (i) What are the functions of interfacing circuit? (8)

(ii) Explain the difference between a parallel and serial interface. (4)

(iii) Explain the term handshaking in microprocessor. (4)

14. (a) Sketch the basic architecture of a PLC and explain the function of each element. (16)

Or

(b) (i) Explain how a PLC can be used to handle an analog input. (6)

(ii) Draw the ladder diagram to represent

(1) two switches are normally open and both have to be closed for a motor to operate.

(2) either of two, normally open, switches have to be closed for a coil to be energised and operate an actuator.

(3) A motor is switched on by pressing a spring-return push-button start switch and the motor remains on until another spring-return push-button stop switch is pressed. (10)

15. (a) Design a engine management system and discuss the parameters relevant to the engine performance. (16)

Or

(b) Design a mechatronics system for sorting parts based on height moving in a conveyor. Sketch the layout and highlight the design aspects. (16)
