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V 4241

B.E/B.Tech. DEGREE EXAMINATION, APRIL/MAY 2008.

Seventh Semester

(Regulation 2004)

Mechanical Engineering

ME 1402 – MECHATRONICS

(Common to B.E. (Part – Time) Sixth Semester Regulation 2005)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Why three concentric tracks are used in an optical incremental encoder?
2. Write two factors that need to be considered in selecting a sensor for a particular application.
3. Explain the working principle of pneumatic diaphragm actuator.
4. What is a darlington pair?
5. Explain the terms hydraulic resistance and hydraulic capacitance?
6. Why derivative controller is never used alone?
7. Explain delay-on and delay-off timer with ladder diagrams
8. Explain “Latching” with ladder diagram.
9. Write the differences between traditional and Mechatronics system design.
10. What are the advantages of using a microprocessor in the place of a mechanical controller for a carburettor of an automobile?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the static (steady state) characteristics of transducers. (8)
 (ii) Explain capacitive push-pull sensor and capacitive proximity sensor. (8)

Or

- (b) (i) Explain the Dynamic characteristics of transducers. (4)
 (ii) Explain any three sensors used for temperature measurement. (12)
12. (a) (i) Explain various types of ball and roller bearings (8)
 (ii) Explain thyristors and triacs in detail. (8)

Or

- (b) (i) Explain the working principle of stepper motor in half step mode. (8)
 (ii) Explain various types of cam followers. (8)
13. (a) (i) Explain fluid system building blocks. (6)
 (ii) Explain electronic proportional derivative (PD) controller with necessary circuit diagrams. (10)

Or

- (b) (i) Explain building blocks for thermal systems. (6)
 (ii) Explain electronic proportional integral (PI) controller with necessary circuit diagrams. (10)
14. (a) (i) Write the specifications of a PLC. (8)
 (ii) 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 50 s to heat the water. The heater is then switched off and another pump is to empty the water from the machine for 100 s. (8)

Or

- (b) (i) Explain the basics of ladder programming used in PLC's. (8)
 (ii) Device a circuit that could be used with a conveyor belt, which is used to move an item to a workstation. The presence of item at the workstation is detected by means of breaking a contact activated by a beam of light to a photo sensor. There it stops for 100 s for an operation to be carried out before moving on and off the conveyor. The motor for the belt is started by a normally open start switch and stopped by a normally closed switch. (8)

15. (a) What is the role of sensors in car management system? Explain with a block diagram. (16)

Or

- (b) With necessary diagrams, explain the automatic car parking system. (16)
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