Question Paper Code : 21576

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Seventh Semester

Mechanical Engineering

ME 2401/ME 71/ME 1402 – MECHATRONICS

(Common to Production Engineering)

(Regulation 2008)

(Common to PTME 2401 – Mechatronics for B.E. (Part-Time) Fifth Semester
Mechanical Engineering – Regulation 2009)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   Mention the functions of a mechatronic system.

2.   List any four types of sensors and mention their features.

3.   Highlight the properties of a stepper motor.

4.   Write short notes on the working of a Ratchet and pawl mechanism.

5.   What do you mean by discrete process controllers?

6.   What are the various stages of operation of an adaptive control system?

7.   Write short notes on the basic arrangement of a PLC system.

8.   State the purpose of shift registers.

9.   List down the various stages in mechatronic system design.

10. Compare traditional and mechatronic design.

PART B — (5 × 16 = 80 marks)

11. (a)   (i)   Discuss how displacement is sensed by LVDT. With neat sketch
                  show how it can be made phase sensitive.   (8)

           (ii) What are the application of bimetallic strip? Discuss their types and
                  principle of operation respectively.   (8)

Or
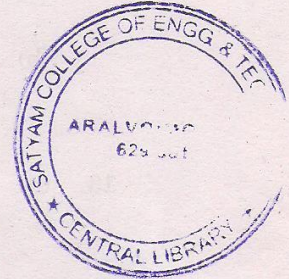
(b) (i) How Bourdon tube is used to measure the pressure?   (8)

        (ii) How is Bernoulli's principle used to measure the flow rate?   (8)

12. (a) (i) Explain the different types of cam and followers.   (10)

        (ii) A toothed gear has 72 teeth and circular pitch of 26mm, find pitch diameter, diametral pitch and module of the gear.   (6)

Or

(b) (i) List the various types of bearings. Also mention their capabilities and application.   (8)

        (ii) Describe the working of an AC servo motor.   (8)

13. (a) (i) Explain the system modeling of a chamber filled with fluid.   (6)

        (ii) Explain the various types of control modes.   (10)

Or

(b) (i) Explain briefly a mathematical model of a vehicle moving on a road.   (8)

        (ii) Explain in detail about digital controllers.   (8)

14. (a) Device a PLC circuit for the following application: Consider a conveyor belt that is to be used to transport goods from a loading machine to a packaging area. When an item is loaded onto the conveyor belt, a contact switch might be used to indicate that the item is on the belt and start the conveyor motor. The motor then has to keep running until the item reaches the far end of the conveyor and falls off into the packaging area. When it does this, a switch might be activated which has the effect of switching off the conveyor motor. The motor is then to remain off until the next item is loaded onto the belt.

Or

(b) Device a PLC circuit for the following application : Consider a simple goods lift to move items from one level to another. The lift is to move upwards when a push button is pressed at the ground level to send the lift upwards or a push button is pressed at the upper level to request the lift to move upwards, but in both cases there is a condition that has to be met that a limit switch indicates that the access gate to the lift platform is closed.

15. (a) Explain about the design of a mechatronics system considering wireless surveillance balloon as an example.

Or

(b) Explain about the mechatronic system design of an automatic car park barrier.

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