

G 1242

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Reg. No.....

Name.....



B.TECH. DEGREE EXAMINATION, MAY 2015

Sixth Semester

Branch : Applied Electronics and Instrumentation Engineering

AI 010 606 L01—MECHATRONICS (Elective I) [AI]

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions.

Each question carries 3 marks.

1. Distinguish open and closed loop control systems with examples.
2. Explain a logarithmic amplifier and its application in signal conditioning.
3. Explain with schematics, the working of a 4/2 way solenoid operated direction control valve.
4. Explain the lithography technique for MEMS production.
5. Derive the basic differential equation for a spring-mass-damper system.

(5 × 3 = 15 marks)

Part B

Answer all questions.

Each question carries 5 marks.

6. Explain the proportional, derivative and integral control modes. Explain a PID controller with a circuit diagram.
7. A strain gauge with a resistance of 200 Ω and gauge factor 2 is connected to a Wheatstone bridge having other arms having fixed resistances of 200 Ω each. If a voltage of 5 V is applied to the bridge, find the output voltage for a strain of 0.001.
8. Draw the schematic circuit diagram for operating a double acting hydraulic linear actuator using a solenoid operated direction control valves and push button switches.
9. Explain the LIGA process for MEMS manufacture.
10. Derive the differential equation for a motor driving a load through a simple spur gear system with negligible friction, which gives the angular displacement of the load with time.

(5 × 5 = 25 marks)

Turn over

Part C

*Answer all questions.
Each question carries 12 marks.*

11. Explain the different stages involved in a mechatronic system design and the factors considered in each stage.

Or

12. Explain the engine management system in a modern automobile with a block diagram from the mechatronic system perspective.
13. Suggest suitable signal conditioning methods for a piezoelectric accelerometer working in a range of 1 Hz to 500 Hz but in an environment prone to radio frequency interference.

Or

14. Explain the advantage of using a microcontroller in place of a thermostat in a refrigerator. What additional components are required for its integration into a refrigerator ?
15. Explain the construction and working of a hybrid stepper motor. How a toothed rotor decreases the stepping angle.

Or

16. Explain the different electronic components that are used as solid state switches and explain their characteristics.
17. Explain the construction and working of a MEMS accelerometer.

Or

18. Explain the applications of cantilever MEMS as temperature and vibration sensors.
19. Develop a mathematical model for a hydraulic system comprising of two tanks interconnected with a valve and a water-feed pipe to one of the tanks.

Or

20. Develop the mathematical model for a step down transformer connected to a resistive load.

(5 × 12 = 60 marks)

