

MODEL QUESTION PAPER

Sixth Semester

Branch: Applied Electronics and Instrumentation

AI 010 606 L01--- MECHATRONICS

Time: Three Hours

Maximum: 100 Marks

PART A

*Answer all questions briefly.
Each question carries 3 marks.*

1. Define mechatronics.
2. Explain the need for signal conditioning.
3. What makes petroleum oil suitable as a hydraulic fluid?
4. What are the challenges facing MEMS industry today?
5. Derive the basic mathematical model of a spring-mass system.

(5x3=15 marks)

PART B

*Answer all questions.
Each question carries 5 marks.*

6. List the advantages and disadvantages of integrating electronics to mechanical devices.
7. An inverting amplifier has an input resistance of $2k\Omega$. Determine the feedback resistance needed to give a voltage gain of 100.
8. If a stepper motor has a step angle of 7.5° , what digital input rate is required to produce a rotation of 10rev/s ?
9. What is MEMS? What are its applications?
10. Explain the mathematical model of a wheel of a car moving along a road.

(5x5=25 marks)

PART C

*Answer any one full question from each module.
Each full question carries 12 marks.*

Module 1

11. With the help of a generalized block diagram, discuss the basic approach of mechatronics. (12 marks)

Or

12. Compare and contrast the traditional design of a watch with that of the mechatronics designed product involving a microprocessor. (12marks)

Module2

13. With neat diagram, explain the working of data acquisition system. (12 marks)

Or

14. Explain the role of microprocessors and microcontrollers in mechatronics system design. (12 marks)

Module3

15. Explain the principle of operation of the following:

a) Brushless d.c. permanent magnet motor

b) Variable reluctance stepper motor (6+6=12 marks)

Or

16. What is the basic principle used in the construction of electromechanical actuators? Explain its application with reference to a solenoid valve. (12 marks)

Module 4

17. What is piezoresistivity? Explain the working of an accelerometer that uses piezoresistivity. (12 marks)

Or

18. Explain the following MEMS applications:

a) Pressure sensor

b) Ink jet printer (12 marks)

Module 5

19. Explain briefly how the mathematical model of a hydraulic system is build up? (12marks)

Or

20. Explain, with necessary mathematical expressions, the electrical system building blocks of MEMS. (12 marks)