Printed Page:- 03 **Subject Code:- AME0512**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: V - THEORY EXAMINATION DEC (2024-2025)

Subject: Mechatronics Systems

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

1-a. The word 'Mechatronics' is derived from ____ (CO1, K1) 1

(a) Mechanical, Electrical & Electronics

(b) Mechanism & Electronics

(c) Mechanical & Electronics

(d) Mechanical & Electrical

1-b. A thermocouple is a example of _____ . (CO1, K1) 1

(a) Transducer

(b) Sensor

(c) Converter

(d) None of the above

1-c. Self-generating transducers are _____ transducers. (CO2, K1) 1

(a) Active

(b) Passive

(c) Secondary

(d) Inverse

1-d. Piezoelectric transducer work when we apply _____ to it. (CO2, K1) 1

(a) Heat

(b) Mechanical force

(c) Vibrations

(d) Illumination

1-e. Actuators are used to _____ (CO3, K1) 1

(a) Sense an object
(b) Activate a chemical
(c) Make a mechanical movement
(d) All of the above

1-f. Which of the following motors can have highest operating speed ? (CO3, K1) 1

(a) BLDC motor
(b) Stepper motor
(c) BDC motor
(d) All of the above

1-g. In Pneumatic actuation system, pneumatic means _____ . (CO4, K1) 1

(a) Fluid
(b) Air
(c) Compressed air
(d) All of the above

1-h. 5 and 2 are _____ respectively in 5/2 direction control valve. (CO4, K1) 1

(a) Model and Part Number
(b) Position and Port
(c) Position and Part
(d) Port and Position

1-i. Which of the following is an open loop control system? (CO5, K1) 1

(a) Air conditioner system
(b) Fridge
(c) Immersion heater
(d) All of the above

1-j. Which of the following is not a programmable device? (CO5, K1) 1

(a) PLC
(b) Microprocessor
(c) Microcontroller
(d) Sensor

2. Attempt all parts:-

2.a. Explain the term 'Bionics'. (CO1, K2) 2

2.b. Define ADC with neat sketch. (CO2, K1) 2

2.c. Describe the concept of micro actuators. (CO3, K1) 2

2.d. Write the classification of control valve. (CO4, K1) 2

2.e. Explain programmable logic device. (CO5, K2) 2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Explain the main components to design a mechatronics system. (CO1, K2)	6
3-b.	Explain the basic components of robotics system. (CO1, K2)	6
3-c.	Explain low pass and high pass filter with neat sketch. (CO2, K2)	6
3-d.	Explain the working of IR sensor with example. (CO2, K2)	6
3.e.	Define switching device. Write the name & working of any 5 switching devices. (CO3, K2)	6
3.f.	What is FRL? Explain the need of FRL in pneumatic actuation system. (CO4, K2)	6
3.g.	Explain the working principle of timer and counter. (CO5, K2)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Discuss all the evolution level of mechatronics with its application. (CO1, K2)	10
4-b.	Explain Mechatronics system with its scope and application. (CO1, K2)	10

5. Answer any one of the following:-

5-a.	Explain the static and dynamic characteristics of sensors. (CO2, K3)	10
5-b.	Explain the working principle and application of Inductive Proximity. (CO2, K3)	10

6. Answer any one of the following:-

6-a.	What is actuation system? Briefly classify the various types of actuators. (CO3, K3)	10
6-b.	Explain the principle of solenoid with diagram. how does solenoid operated valve work? (CO3, K3)	10

7. Answer any one of the following:-

7-a.	Briefly explain the pneumatic actuation system with suitable diagrams and write its applications. (CO4, K3)	10
7-b.	Discuss the function of directional control valve and design a circuit for 4/3 directional control valve. (CO4, K3)	10

8. Answer any one of the following:-

8-a.	Define PLC and explain the PLC architecture with diagram. (CO5, K3)	10
8-b.	Write the ladder program for PLC to the start and stop the motor with overload coil. (CO5, K4)	10