Printed Page:- Subject Code:- AME0512

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech.

SEM: V - THEORY EXAMINATION (2022 - 2023)

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 The word 'Mechatronics' is derived from ____ (CO1) 1

(a) Mechanical, Electrical & Electronics

(b) Mechanism & Electronics

(c) Mechanical & Electronics

(d) Mechanical & Electrical

1 A humanoid robot is an example of _____ (CO1) 1

(a) Artificial intelligence

(b) Stand-alone system

(c) Large factory systems

(d) High level distributed sensor microcontroller actuator

1 A High Pass filter is a _____ filter. (CO2) 1

(a) Electric

(b) Electronic

(c) Mechanical

(d) Both a and b

| | | |
|---|---|---|
| 1 | An LVDT has an output in the form of_____ (CO2) | 1 |

(a) Linear displacement of core

(b) Pulse

(c) Rotary movement of core

(d) None of the above

| | | |
|---|---|---|
| 1 | The basic function of the spring in a control valve is to___ (CO3) | 1 |

(a) Characterize flow

(b) Oppose the diaphragm so as to position the valve according to signal pressure

(c) Close the valve if air failure occurs

(d) Open the valve if air failure occurs

| | | |
|---|---|---|
| 1 | Which type of coil is used in a solenoid? (CO3) | 1 |

(a) Electromagnetic

(b) Electrical

(c) Mechanical

(d) Chemical

| | | |
|---|---|---|
| 1 | What is the function of the flow control valve? (CO4) | 1 |

(a) Controls the direction of flow of oil

(b) To pump hydraulic oil to the hydraulic circuit.

(c) It converts the mechanical energy to hydraulic energy

(d) It controls the rate of flow of oil

| | | |
|---|---|---|
| 1 | Which of the following is not a basic element of Mechatronics System? (CO4) | 1 |

(a) Learning

(b) Sensing

(c) Acting

(d) Controlling

| | | |
|---|---|---|
| 1 | Which of the following element is not used in an automatic control system? (CO5) | 1 |

(a) Final control element

(b) Sensor

(c) Oscillator

(d) Error detector

| | | |
|---|---|---|
| 1 | By default, _____ contact will not allow the flow of current unless energized. (CO5) | 1 |

(a) NO

(b) NC

(c) Both a & b

(d) None of the above

2. Attempt all parts:-

| | | |
|---|---|---|
| 2.a. | Define mechatronics with an example. (CO1) | 2 |
| 2.b. | Enlist various type of ADC. (CO2) | 2 |
| 2.c. | Write the classification of stepper motor. (CO3) | 2 |
| 2.d. | Differentiate hydraulics and pneumatics with diagram (CO4) | 2 |
| 2.e. | Explain PLD with example. (CO5) | 2 |

SECTION B 30

3. Answer any five of the following:-

| | | |
|---|---|---|
| 3 | Explain the main components to design a mechatronics system. (CO1) | 6 |
| 3 | What is bionics? write any 3 applications of bionics in real world. (CO1) | 6 |
| 3 | Derive an expression for high pass filter response. (CO2) | 6 |
| 3 | Differentiate Transducer and Sensor with neat sketch. (CO2) | 6 |
| 3.e. | Sketch and explain the actuator functional diagram. (CO3) | 6 |
| 3.f. | Discuss at least 10 graphical representation used in pneumatics system. (CO4) | 6 |
| 3.g. | Explain the basic model of PLC with its components. (CO5) | 6 |

SECTION C 50

4. Answer any one of the following:-

| | | |
|---|---|---|
| 4 | Design a mechatronics system for an automatic washing machine. (CO1) | 10 |
| 4 | Difference open and closed loop system with suitable diagram. (CO1) | 10 |

5. Answer any one of the following:-

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

6. Answer any one of the following:-

| | | |
|---|---|---|
| 6 | Explain the working principal of 3-phase induction motor with neat sketch. (CO3) | 10 |
| 6 | Explain the working principle and selection criteria of Mechano-electrical actuators. (CO3) | 10 |

7. Answer any one of the following:-

| | | |
|---|---|---|
| 7 | What is the function of directional control valve? Design a circuit for 5/3 directional control valve. (CO4) | 10 |
| 7 | Explain FRL system used in pneumatic actuation system with a neat sketch.(CO4) | 10 |

8. Answer any one of the following:-

| | | |
|---|---|---|
| 8-a. | Explain the basic functions of counters & timers. Design a logic with use of counter with 5 count & timer with 5 second. (CO5) | 10 |
| 8-b. | What is ladder programming? Write a ladder program for start & stop a motor with overloading circuit. (CO5) | 10 |