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Printed Page:-4 **Subject Code:- AEC0712**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
B.Tech
SEM: VII- THEORY EXAMINATION (2025 - 2026)
Subject: Industrial Automation and Programming

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. Which of the following is NOT a type of robot? (CO1, K2) 1

(a) Mobile robot
(b) Industrial robot
(c) Humanoid robot
(d) Television robot

1-b. Industrial robots are commonly used for: (CO1, K1) 1

(a) Cooking
(b) Teaching
(c) Welding and assembly
(d) Playing games

1-c. What is the function of a pneumatic valve? (CO2, K1) 1

(a) To control airflow
(b) To store air
(c) To increase voltage
(d) To reduce temperature

1-d. A directional control valve is used to: (CO2, K1) 1

(a) Increase pressure
(b) Control fluid direction
(c) Filter oil
(d) Reduce flow

1-e. What is the main function of a solenoid in a valve? (CO3, K1) 1

(a) Measure pressure
(b) Create magnetic force
(c) Increase voltage
(d) Control temperature

1-f. Which component is used to detect object presence? (CO3, K1) 1

(a) Relay
(b) Sensor
(c) Switch
(d) Valve

1-g. A timer in automation primarily provides a: (CO4, K1) 1

(a) Time delay
(b) Pressure boost
(c) Current amplification
(d) Speed reduction

1-h. Grouping cylinders in electro-pneumatic design is mainly used to: (CO4, K2) 1

(a) Reduce air supply pressure
(b) Achieve synchronized motion of multiple actuators
(c) Increase electrical consumption
(d) Isolate circuits from sensors

1-i. PLC stands for ____. (CO5, K1) 1

(a) Programmable Logic Controller
(b) Process Logic Computer
(c) Programmable Language Circuit
(d) None

1-j. One major advantage of PLCs is _____. (CO5, K2) 1

(a) High rewiring cost
(b) Easy reprogramming
(c) Difficult maintenance
(d) Fixed logic

2. Attempt all parts:-

2.a. Define Robot.(C01,K1) 2

2.b. Define a pneumatic valve and state its basic purpose in a pneumatic circuit. (CO2, K1) 2

2.c. Define electro-pneumatics and state its basic purpose in industrial automation. (CO3, K1) 2

2.d. Define a timer in an electro-pneumatic system. (CO4, K1) 2

2.e. Define a Programmable Logic Controller (PLC). (CO5, K1) 2

SECTION-B 30

3. Attempt all parts:-

3.a. Answer any one of the following:-

3.a.(i)	Explain in detail the different types of robots based on their structure and applications with suitable examples. (CO1, K3)	6
3.a.(ii)	Discuss the advantages and limitations of using robots in modern manufacturing industries. (CO1, K4)	6
3.b. Answer any one of the following:-		
3.b.(i)	Discuss the different types of pressure control valves used in pneumatic systems along with their applications. (CO2, K2)	6
3.b.(ii)	Describe the construction and working of single-acting and double-acting actuators. Compare their industrial uses. (CO2, K4)	6
3.c. Answer any one of the following:-		
3.c.(i)	Explain the working principle of an electro-pneumatic system and describe how electrical and pneumatic components coordinate to control automation tasks. (CO3, K3)	6
3.c.(ii)	Describe the classification of electro-pneumatic elements with examples, and explain how each category contributes to automation. (CO3, K2)	6
3.d. Answer any one of the following:-		
3.d.(i)	Describe the construction and operation of a pneumatic counter. Give any two industrial applications. (CO4, K3)	6
3.d.(ii)	Compare single-solenoid and double-solenoid valves in terms of structure, operation, and industrial usage. (CO4, K4)	6
3.e. Answer any one of the following:-		
3.e.(i)	Explain the basic architecture of a PLC with a neat diagram. (CO5, K2)	6
3.e.(ii)	Write any four advantages of using PLCs in industrial applications. (CO5, K1)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Describe the evolution of industrial robots and discuss their role in transforming modern manufacturing industries. (CO1, K5	10
4-b.	Explain the working principles and applications of Cartesian, Cylindrical, Spherical, SCARA, and Articulated robots. Give examples of industries using them. (CO1, K3)	10

5. Answer any one of the following:-

5-a.	Explain the role of motion control, drive systems, and communication networks in coordinating multi-device automation in warehouses. (CO2, K5)	10
5-b.	Explain the different types of valves used in robotics and automation systems. Describe their working principles and give suitable examples of their applications.(CO2,K3)	10

6. Answer any one of the following:-

6-a.	Explain the construction and working of an electro-pneumatic system with suitable examples. (CO3, K4)	10
6-b.	Discuss the classification of electro-pneumatic elements and explain the function of each class in detail. (CO3, K4)	10

7. Answer any one of the following:-

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7-a.	Discuss the architecture of a modern computer process control system. Explain components, communication, field devices, and control algorithms in detail. (CO4, K4)	10
7-b.	Describe the block diagram and working of Distributed Control Systems (DCS). Explain why DCS is preferred for continuous industrial processes. (CO4, K3)	10

8. Answer any one of the following:-

8-a.	Explain the importance of PLC memory organization in program execution. (CO5, K2)	10
8-b.	Write a note on RTO (Retentive Timer). Give an example. (CO5, K2)	10