RollNo. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, APR / MAY 2025

INDUSTRIAL ENGINEERING
Semester IV
IE23402 & MANUFACTURING AUTOMATION
(Regulation2023)

Time:3hrs Max.Marks: 100

CO1	Define automation and justification in manufacturing.
CO2	Explain the control technologies in automation.
CO3	Explain the concept of fixed automation using transfer lines.
CO4	Describe the programmable automation such as CNC and industrial robotics.
CO5	Use of automated material handling, storage and data capture.

BL – Bloom's Taxonomy Levels
(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A(10x2=20Marks)
(Answer all Questions)

Q.No.	Questions	Marks	CO	BL
1	Define automation in production systems	2	CO1	BL1
2	List three principles of automation.	2	CO1	BL1
3	Differentiate between open-loop and closed-loop control.	2	CO2	BL2
4	Sketch a simple ladder logic diagram for a lamp control.	2	CO2	BL2
5	What is a buffer in production lines?	2	CO3	BL1
6	State two advantages of automated assembly systems.	2	CO3	BL2
7	List any two industrial applications of robots.	2	CO4	BL1
8	What is part programming in CNC machining?	2	CO4	BL1
9	Differentiate the Absolute and Incremental Positioning	2	CO5	BL2
10	What are the types of storage systems?	2	CO5	BL1

PART- B(5x 13=65 Marks)
(Restrict to a maximum of 2 subdivisions)

Q.No.	Questions	Marks	CO	BL
11 (a)	Explain in detail the different types of automation with examples. Discuss their advantages and disadvantages.	5 8	CO1	BL3
	OR			
11 (b)	i) A batch of 250 parts is processed through a single-machine work cell. Setup time for the batch is 2 hours, and each part's processing time is 3 minutes. There is also 0.5 minute of material handling time per part. (a) Calculate the total manufacturing lead time to complete the batch. (b) Determine the average production time per part (cycle time per part) in this batch production scenario. (c) If the batch size were doubled to 500, explain how the average time per part would change. ii) Explain the manufacturing operation costs, including fixed and variable costs, with examples	5 8	CO1	BL3
12 (a)	Discuss the conversion process of analog to digital and digital to analog with numerical examples.	13	CO2	BL3

	OR			
12 (b)	Explain the following capabilities of computer control in automation systems. i) Polling ii) Interlocks iii) Interrupt System, iv) Exception Handling	13	CO2	BL3
13 (a)	i) Describe the configuration and operation of an automated production line. ii) Discuss the advantages and applications of Automated production lines	6 7	CO3	BL4
	OR			
13 (b)	i) Explain the Multi-Station Automatic Assembly System ii) A 10 station in-line assembly machine has an ideal cycle time = 6 sec. The base part is automatically loaded prior to the first station, and components are added at each of the stations. The fraction defect rate at each of ten stations is q = 0.01, and the probability that a defect will jam is m = 0.5. When a jam occurs, the average downtime is 2 min. Cost to operate the assembly machine is Rs. 42/hr. Other costs are ignored. Determine a) average production rate of all assemblies, b) yield of good assemblies, c) average production rate of all good product, d) uptime efficiency of the assembly machine, and e) cost per unit.	6 7	CO3	BL4
14 (a)	Explain the working and features of CNC systems with a neat block diagram.	13	CO4	BL2
	OR			
14 (b)	Explain the classification of robots based on configuration and movement.	13	CO4	BL2
15 (a)	Explain the different types of AGVs used for material handling.	13	CO5	BL3
	OR			
15 (b)	Discuss the following methods of automatic data capture. i) Bar code technology ii) RFID	13	CO5	BL3

PART- C(1x 15=15Marks)

(Q.No.16 is compulsory)

Q.No.	Questions	Marks	CO	BL
16.	Explain the followings with suitable example: i) USA principle ii) Ten automation strategies	15	CO1	BL3