ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. - END SEMESTER EXAMINATION, May 2025

INDUSTRIAL ENGINEERING
Semester VI
IE5651 Manufacturing Automation
(Regulation 2019)

Time: 3hrs   Max.Marks: 100

CO 1	Selection of automated equipment with cost justification .
CO 2	Ability to understand control technologies.
CO 3	Selection of buffer size and location in transfer lines.
CO 4	Ability to prepare a simple CNC program, select a robot configuration for given application.
CO 5	Recommend an appropriate automated material handling, storage and data capture method.

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

PART- A (10 x 2 = 20 Marks)
(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	Compare the three types of automation?	2	1	L2
2	List any four limitations of automation in manufacturing industry.	2	1	L1
3	What is adaptive control?	2	2	L1
4	What is a programmable logic controller?	2	2	L1
5	What is availability with reference to reliability of an equipment?	2	3	L2
6	What is automated production line?	2	3	L1
7	What are the uses of higher order interpolation schemes in NC systems?	2	4	L2
8	Draw the work volume of polar and cylindrical configuration of an industrial robot?	2	4	L1
9	List any four automated material handling equipment that are useful in manufacturing industry.	2	5	L2
10	What are the types of conveyor system?	2	5	L1

PART- B (5 x 13 = 65 Marks)
(each subdivisions carry equal marks)

Q. No	Questions	Marks	CO	BL
11 (a) (i)	Explain the automation strategies in terms of various manufacturing concept.	6.5	1	L3
(ii)	The following data apply to the operation of a particular automated manufacturing system: Direct labor rate = \$20.00/h Number of operators required = 2 Applicable labor factory overhead = 25% Capital investment in system = \$300000 Service life = 10 years Salvage value = \$30000 Applicable machine factory overhead rate =30% The system is operated one shift (2000 h/yr). Use a rate of return of 25% to determine the appropriate hourly rate for this man-machine system.	6.5	1	L4
	OR			

			Marks	CO	BL
11 (b) (i)	Discuss the different methods of evaluating investment alternatives		6.5	1	L3
(ii)	The average part produced in a certain batch manufacturing plant must be processed through an average of six machines. There are 20 new batches of parts launched each week. Other pertinent data are as follows: Average production time = 6 min Average setup time = 5 h Average batch size = 25 parts Average non-operation time per batch = 10 h There are 18 machines in the plant. The plant operates an average of 70 production hours per week. Scrap rate is negligible. Determine the average level of work-in-process in the plant		6.5	1	L4
12 (a) (i)	Explain the continuous and discrete variables and parameters with examples.		6.5	2	L3
(ii)	What are discrete control systems? Explain the event-driven and time-driven changes with examples.		6.5	2	L4
OR					
12 (b) (i)	What is computer – process control? Explain the Interrupt Systems.		6.5	2	L3
(ii)	What is analog-to-digital conversion? Explain the successive approximation method used in A to D conversion.		6.5	2	L4
13 (a) (i)	Analyze a transfer line and derive expressions for its performance measure without storage buffer, using upper bound approach.		6.5	3	L4
(ii)	Explain the transfer mechanisms used to move parts between stations in transfer lines.		6.5	3	L3
OR					
13 (b) (i)	What is a buffer? Explain its uses and limitations in automated production line.		6.5	3	L3
(ii)	Explain the automated assembly system with schematic representation		6.5	3	L4
14 (a) (i)	What is open loop and closed loop system? Explain the operation of an optical encoder as a feedback sensor in closed loop system.		6.5	4	L4
(ii)	Explain the components of CNC.		6.5	4	L3
OR					
14 (b) (i)	Draw any five configurations of body and arm assembly of robots used in manufacturing industries.		6.5	4	L4
(ii)	How tools can be used as end effectors? Explain with example.		6.5	4	L3
15 (a) (i)	Draw the structure of an AS/RS. Explain its configuration and control features.		6.5	5	L3
(ii)	Explain the traffic control and safety in AGVS.		6.5	5	L4
OR					
15 (b) (i)	List the automatic data capture methods? Explain any one method in detail.		6.5	5	L4
(ii)	What is carousal storage system? Explain its types with needed sketches.		6.5	5	L3

PART- C (1 x 15 = 15 Marks)
(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16. (i)	Explain the job of part programmer in computer assisted part programming.	5	4	L5
(ii)	How to decide between conventional and automated equipment for manufacturing with the help of break-even chart?	10	4	L6