

May 2025

B.Tech. (ME) (Sixth Semester)**FLEXIBLE MANUFACTURING SYSTEMS**
(PEC-ME-621/21) *Time : 3 Hours]* [Maximum Marks : 75]

Note : It is compulsory to answer all the questions (1.5 marks each) of Part A in short. Answer any *four* questions from Part B in detail. Different sub-parts of a question are to be attempted adjacent to each other.

Part A 1. (a) Define Automation. What are the different types of automation ? 1.5

 (b) What is the importance of buffer storage in an automated flow line ? 1.5

(c) What is Low cost automation ? What are its advantages ? 1.5

(d) Explain the role of part feeding devices in automated assembly systems. 1.5

(e) What are part families in Group Technology ? 1.5

(f) State any *two* features of the Opitz parts classification and coding system. 1.5

(g) What are the different types of FMS ? 1.5

(h) Explain the concept of Single-Minute Exchange of Die (SMED). 1.5

(i) A robot has an accuracy of ± 0.2 mm and a repeatability of ± 0.05 mm. Explain what these terms mean. 1.5

(j) What is the interlock of work cell control ? 1.5

Part B

2. (a) Describe the different methods of work part transport in automated flow lines. 8

(b) Explain the various automation strategies used in manufacturing industries. 7

3. (a) Discuss the design considerations for automated assembly systems. 8

(b) The cycle time for a given assembly workhead is 0.25 min. The parts feeder has a feed rate of 25 components/min. The probability that a given component fed by the feeder will pass through the selector is 0.2. The number of parts in the feed track corresponding to low level sensor is 8. The capacity of the feed track is 24 parts. 7

(i) Determine how long will it take for the supply of parts in the feed track to go from 24 to 8.

(ii) Determine how long will it take on average for the supply for parts to go from 8 to 24.

4. The following table lists the weekly quantities and routings of ten parts that are being considered for cellular manufacturing in a machine shop. Parts are identified by letters and machines are identified numerically. For the data given : 15

(a) Develop the part-machine incidence matrix.

(b) Apply the rank-order clustering technique to the part-machine incidence matrix to identify logical part families and machine groups.

(c) Determine the most logical sequence of machines

(d) Construct the network diagram

(e) Compute the percentages of in-sequence moves, bypassing moves and backtracking moves.

Part	Weekly	Machine	Part	Weekly	Machine
	Quantity	Routing		Quantity	Routing
A	50	3 → 2 → 7	F	60	5 → 1
B	20	6 → 1	G	5	3 → 2 → 4
C	75	6 → 5	H	100	3 → 2 → 4 → 7
D	10	6 → 5 → 1	I	40	2 → 4 → 7
E	12	3 → 2 → 7 → 4	J	15	5 → 6 → 1

5. (a) Define Flexible Manufacturing System (FMS). What are its different components ?

8

(b) Explain different types of FMS configurations with suitable diagrams.

7

6. (a) Discuss the various robot configurations in detail.

8

(b) What are the different types of sensors used in robotics ? Explain their applications.

7

7. (a) Discuss the various types of robot programming methods with their advantages and disadvantages.

8

(b) Discuss the various applications of Industrial Robots.

7

