

Roll No.

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B. Tech. (ME/ME (Hindi)) (Sixth Semester)

Flexible Manufacturing System

(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) What do you mean by Automation ? Give reasons for automation. **1.5**
- (b) What is buffer storage ? Give reasons to include storage buffer in an automated production line. **1.5**
- (c) What is the ideal cycle time for the single-station assembly machine ? **1.5**
- (d) What is cellular manufacturing ? What are its advantages ? **1.5**

- (e) What is a part family ? Name any *three* methods for solving the problem of grouping parts into part families. **1.5**
- (f) What is the difference between a hierarchical structure and a chain-type structure in a classification and coding scheme ? **1.5**
- (g) What is the difference between the primary and secondary handling systems that are common in flexible manufacturing systems ? **1.5**
- (h) What is a playback robot with point-to-point control ? **1.5**
- (i) What is the difference between repeatability and accuracy in a robotic manipulator ? **1.5**
- (j) What is the advantage of offline programming of robots ? **1.5**

Part B

2. (a) What are the types of automation ? Explain their salient features. **7**
- (b) Discuss the various transfer mechanisms used to move parts between workstations. **8**
3. (a) Describe the various elements of the part delivery system used in automated assembly. **7**

- (b) A dial-indexing table has 6 stations. One station is used for loading and unloading, which is accomplished by a human worker. The other five perform processing operations. The longest process takes 25 sec and the indexing time = 5 sec. Each station has a frequency of failure = 0.015. When a failure occurs it takes an average of 3.0 min to make repairs and restart. Determine : **8**
- (i) hourly production rate
- (ii) line efficiency.

4. (a) What is Group Technology ? Describe the four Common Group Technology cell configurations according to the number of machines and the degree to which the material flow is mechanized between machines. **7**
- (b) Four machines used to produce a family of parts are to be arranged into a GT cell. The from-to data for the parts processed by the machines are shown in the table below : **8**
- (i) Determine the most logical sequence of machines for this data.

- (ii) Construct the network diagram for the data, showing where and how many parts enter and exit the system.
- (iii) Compute the percentages of in-sequence moves, bypassing moves, and backtracking moves in the solution.
- (iv) Develop a feasible layout plan for the cell.

From	To			
	1	2	3	4
1	0	10	0	40
2	0	0	0	0
3	50	0	0	20
4	0	50	0	0

- 5. (a) What is a Flexible Manufacturing System ? Describe four dimensions of flexibility. 7
- (b) Explain in detail the various components of FMS. 8
- 6. (a) Explain the different end effectors used with robots. 7
- (b) Discuss the various applications of Industrial Robots. 8

- 7. (a) Describe the functions usually performed by a robotic work cell controller. 7
- (b) What is meant by robot programming ? Discuss any two programming methods in detail. 8