May 2024

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 subparts 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.

To

From	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**