

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE - SEMESTER-VIII • EXAMINATION – SUMMER 2013**

Subject Code: 182002

Date: 13-05-2013

Subject Name: Automated Manufacturing – II

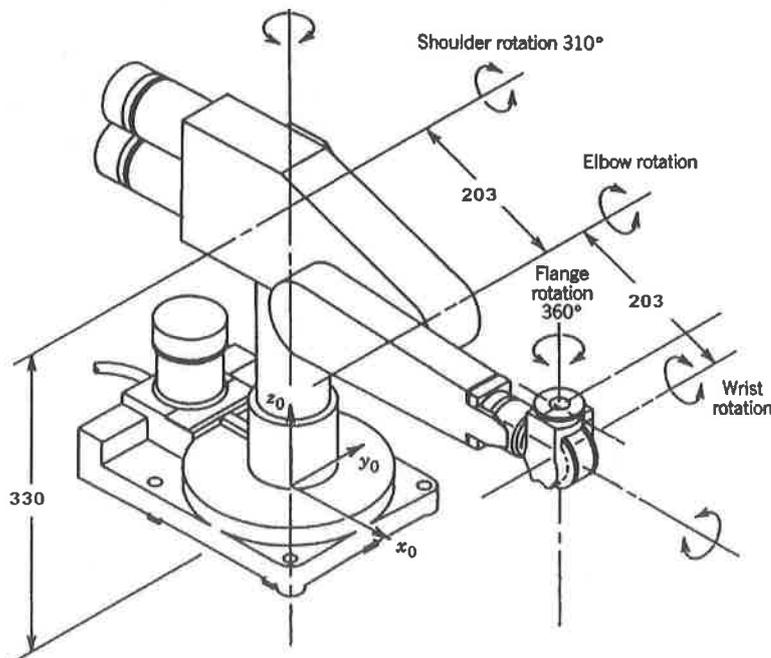
Time: 10.30 am - 01.00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** Explain the following related to a robot:- 07
1. Accuracy
  2. Repeatability
  3. Compliance
- (b)** The robot shown in the below figure is in the home position. The axes of motion are as shown. 07
- Complete the description of all joint coordinate systems by assigning the proper set of x and y axes.
  - Construct a table for the four joint parameters for this robot.



- Q.2 (a)** What do you understand by PFA? Explain the steps included in its procedure. 07
- (b)** Differentiate Rank order clustering and Single linkage cluster analysis as algorithms used in GT. 07

OR

- (b)** What are the socioeconomics issues in using robots to replace human workers from the workplace? Explain. 07
- Q.3 (a)** Differentiate the various configurations of robot considering the applications and sketches. 07
- (b)** List and explain the factors to be considered during the selection and design of the grippers. 07

**OR**

- Q.3 (a)** What is meant by robot anatomy? What are the three degrees of freedom associated with the arm and body motion? **07**
- (b)** List and explain the desirable features of sensors used in Robotic systems. **07**

- Q.4 (a)** Evaluate the following : **07**

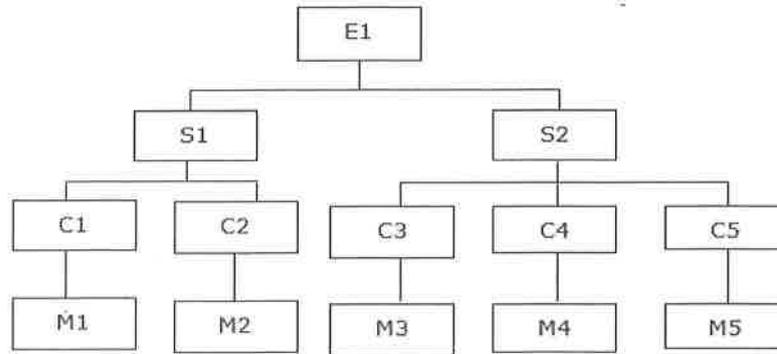
1. FMS is a sophisticated type of GT cell
2. Capacity planning is to done in two stages in MRP.

- (b)** A flexible manufacturing cell consists of two machining workstations plus a load/unload station. Station 2 performs milling operation and consists of one server. Station 3 has one server that performs drilling. Three stations are connected by a part handling system that has one work carrier. The mean transport time is 2.5 min. The FMC produces three parts A, B, and C. The part mix fractions and the process routings for the parts are presented in the table below. The operation frequency is 1.0 for all the operations. Determine (a) the maximum production rate of the FMC, (b) corresponding production rate of each product, (c) utilization of each machine in the system, and (d) no. of busy servers at each station. **07**

Part j	Part Mix $P_j$	Operation k	Description	Station i	Process time (min)
A	0.2	1	Load	1	3
		2	Mill	2	20
		3	Drill	3	12
		4	Unload	1	2
B	0.3	1	Load	1	3
		2	Mill	2	15
		3	Drill	3	30
		4	Unload	1	2
C	0.5	1	Load	1	3
		2	Drill	3	14
		3	Mill	2	22
		4	Unload	1	2

**OR**

- Q.4 (a)** Consider the product structure for end item A as shown in figure below. The end item demands from the MPS for the period of weeks 3 through 10 are 20,30,10,40,50,30,30 and 40 units respectively. The manufacturing lead times for E1, S2 and C4 are 3, 2 and 1 week respectively while the ordering lead time for M4 is 1 week. On hand inventory for E1, S2, C4 and M4 is 50, 100, 50 and 150 respectively. The Scheduled Receipts for the products are: E1 - 0, S2 - 100 the 1<sup>st</sup> and 30 in and 2<sup>nd</sup> week, C4 - 50 in the 1<sup>st</sup> and 20 in the 2<sup>nd</sup> week, M4 - 50 in the 1<sup>st</sup> week and 300 in the 4<sup>th</sup> week respectively. Carry out the materials requirement planning procedure for raw material M4 required to manufacture C4. **07**



- (b) Explain the types of flexibilities associated with Flexible Manufacturing System. **07**
- Q.5** (a) Compare electric drive with pneumatic drive based on accuracy, size, cost and Application applied to a robot. **07**
- (b) Discuss the different types of automation with examples. **07**
- OR**
- Q.5** (a) Explain the different types of grippers and sensors used in Robots **07**
- (b) Discuss the role of Machine Vision when applied to Robots. **07**

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