

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

**GUJARAT TECHNOLOGICAL UNIVERSITY**

**BE - SEMESTER-VIII (NEW) - EXAMINATION – SUMMER 2018**

**Subject Code: 2182002**

**Date: 07/05/2018**

**Subject Name: Automated Manufacturing - II**

**Time: 10:30 AM to 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.
4. Diagrams with poor quality may not be awarded any credit.

	<b>MARKS</b>
<b>Q.1</b> (a) Describe the importance of 'composite part' for part classification and coding system used in group technology.	<b>03</b>
(b) Briefly describe the following flexibilities of Flexible Manufacturing System: Volume flexibility Materials handling flexibility	<b>04</b>
(c) Draw completely labeled schematic line diagrams of different robot configurations and related work volume superimposed on it.	<b>07</b>
<b>Q.2</b> (a) Briefly describe the factors affecting the load carrying capacity of a robot.	<b>03</b>
(b) Explain the working principle of Hollier Method in deciding the sequence of machines and material flow.	<b>04</b>
(c) Differentiate amongst fixed automation, programmable automation and flexible automation. Support your answer with suitable examples to compare volume of production and product variety.	<b>07</b>
<b>OR</b>	
(c) Give suitable example of quality control in industry handled with the help of robotic vision system. Describe the set up and other requirements with the help of appropriate diagrams.	<b>07</b>
<b>Q.3</b> (a) Explain manufacturing lead time in context of Material Requirement Planning (MRP).	<b>03</b>
(b) Give classification of robot end effectors. Draw neat schematic diagrams of any two mechanisms used in robot end effectors.	<b>04</b>

- (c) Figure 1 represents 2R planar configuration of robotic arm. Assign necessary coordinate frames and produce table of joint parameters based on D-H representation. Find out individual transformation matrices between joints and final transformation matrix from base to end effector using D-H representation. For  $\theta_1 = 0^0$  and  $\theta_2 = 90^0$ , find out the position of end effector using final transformation matrix. **07**

**OR**

- Q.3** (a) Discuss and describe any one technology used in vehicle guidance for Automated Guided Vehicle System (AGVS) in FMS. **03**
- (b) Briefly classify and describe various programming methods of robot. **04**
- (c) Bring out the importance of D-H matrix used to represent robotic configurations in forward kinematics. Describe joint-link parameters used for D-H representation and necessary motions to transform from one reference frame to the next one. **07**
- Q.4** (a) Explain the following terminology for batch production on given Flexible Manufacturing System (FMS):  
Production rate; bottle neck **03**
- (b) Briefly discuss the following terms for Materials Requirement Planning (MRP):  
1. Product structure and bill of materials  
2. Master Production Schedule **04**
- (c) Enumerate the various sensors used in a robot arm for position control. Illustrate in brief the working principle of those sensors. **07**

**OR**

- Q.4** (a) Evaluate the statement: Manufacturing attributes are more useful than design attributes for part classification and coding system. **03**
- (b) Describe briefly the requirements of hydraulic, pneumatic and electrical drive systems used in robotic application for the performance of a specific task. **04**
- (c) Discuss relative merits and demerits of CIM system. Also illustrate necessary elements of CIM system for its successful implementation. **07**
- Q.5** (a) Differentiate amongst resolution, accuracy and repeatability of robot manipulator. **03**
- (b) With the help of neat schematic diagrams briefly explain the various layout configurations of Flexible Manufacturing System (FMS). **04**

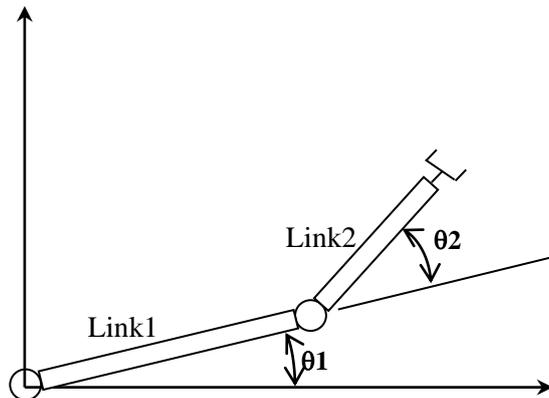
- (c) Explain with the help of block diagram various inputs of MRP (Material Requirement Planning). **07**

**OR**

- Q.5 (a)** Discuss in brief the significance of trajectory planning of robot manipulator with suitable example. **03**

- (b) Explain the following terms for materials requirement planning: **04**
- (i) Commonly used items
  - (ii) Dependent demand and independent demand

- (c) Briefly describe the concept of the following classification and coding systems. Compare relative merits and demerits between them. **07**
1. Opitz classification and coding system
  2. PFA classification and coding system



Given: Length of link1 = L; Length of link2 = M

**Figure 1. Planar 2R Robotic Arm**

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