

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VIII • EXAMINATION – SUMMER • 2015****Subject Code: 182002****Date: 11/05/2015****Subject Name: Automated Manufacturing-II****Time: 10.30AM-01.00PM****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)** Consider Stanford manipulator shown in figure 1. Using D-H notation Construct **07**
1. Set of robotic coordinate frame
 2. A table for joint parameter
 3. Each joint individual matrix

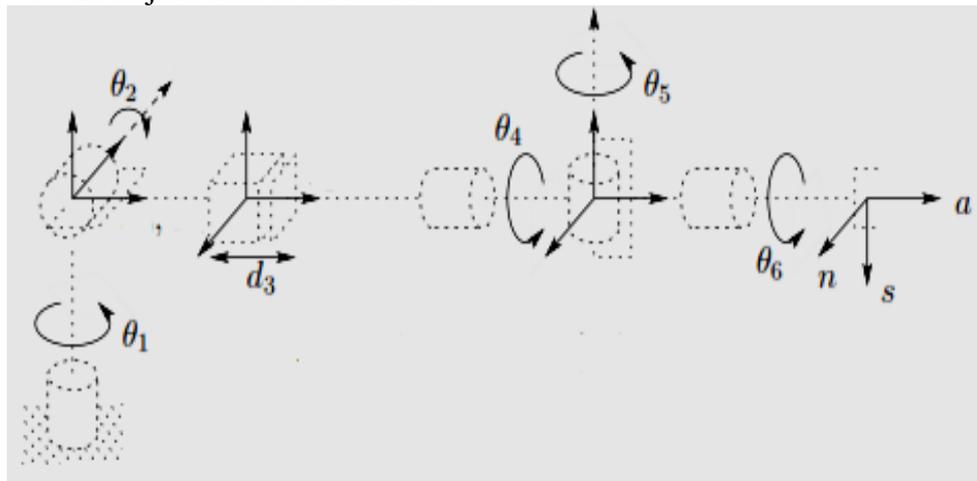


Figure 1. D-H coordinate frame assignment for Stanford manipulator

- (b)** Differentiate between a SCARA and a Gantry robot. **07**
- Q.2 (a)** Using the notation scheme for defining manipulator configuration. Draw the diagrams of the following robots: (a) LVL (b) VVR (c) TRT **07**
- (b)** Explain in briefly. What are the different types of drive system used in robots? **07**
- OR**
- (b)** Explain the significance of the following for a robot. **07**
1. Compliance.
 2. Work envelope.
 3. Accuracy.
- Q.3 (a)** What are the basic functions of sensors in work cell? Explain the function of acoustics and tactile sensors. **07**
- (b)** In machine loading and unloading application, what is the advantage of a dual gripper over a single gripper? **07**
- OR**
- Q.3 (a)** Define the classification and structures of mechanical gripper. **07**
- (b)** Difference between the primary handling and secondary handling systems in flexible manufacturing systems. **07**

- Q.4 (a)** An FMS consists of three station plus a load/unload station. station1 loads and unloads parts from the FMS using two servers (material handling workers).station 2 performs horizontal milling operations with two servers (two identical CNC horizontal milling machines).station 3 performs vertical milling operations with three servers (three identical CNC vertical milling machines). Station 4 performs drilling operations with two servers (two identical drilling presses). The machines are connected by a part handling system that has two work carriers and a mean transport time =3.5 min. The FMS produces three parts, A, B and C. the operation frequency $f_{ijk}=1.0$ for all operation. Determine:

- (a) Maximum production rate of the FMS
 (b) Utilization of each machine in the system
 (c) Average utilization of the system

| Part j | Part Mix P_i | Operation K | Description | Station i | Process time(min) |
|--------|----------------|-------------|-------------|-----------|-------------------|
| A | 0.2 | 1 | Load | 1 | 4 |
| | | 2 | H.Mill | 2 | 15 |
| | | 3 | V.Mill | 3 | 14 |
| | | 4 | Drill | 4 | 13 |
| | | 5 | Unload | 1 | 3 |
| B | 0.2 | 1 | Load | 1 | 4 |
| | | 2 | Drill | 4 | 12 |
| | | 3 | H.Mill | 2 | 16 |
| | | 4 | V.Mill | 3 | 11 |
| | | 5 | Drill | 4 | 17 |
| | | 6 | Unload | 1 | 3 |
| C | 0.25 | 1 | Load | 1 | 4 |
| | | 2 | H.Mill | 2 | 10 |
| | | 3 | Drill | 4 | 9 |
| | | 4 | Unload | 1 | 3 |

- (b)** Difference between a hierarchical structure and chain-type structure in a classification and coding scheme. **07**

OR

- Q.4 (a)** Apply the rank order clustering techniques to the part-machine incidence matrix in the table that follows to identify logical part families and machine groups. Parts are identified by letters and machines are identified numerically. **07**

| Parts | Machines | | | | |
|-------|----------|---|---|---|---|
| | A | B | C | D | E |
| 1 | | 1 | 1 | | 1 |
| 2 | 1 | 1 | | 1 | |
| 3 | 1 | | | | 1 |
| 4 | | 1 | 1 | 1 | |
| 5 | 1 | 1 | 1 | | |
| 6 | | | | | 1 |
| 7 | 1 | | | | 1 |
| 8 | 1 | 1 | 1 | | 1 |

- (b)** Discuss the following terms in FMS **07**
- machine flexibility
 - routing flexibility
 - production flexibility
 - expansion flexibility

- Q.5** (a) Briefly explain the two basic type approaches of computer aided process planning. **07**
- (b) Define the master production scheduling. Explain the factors that need to be taken into account while developing master production schedule. **07**
- OR**
- Q.5** (a) Explain the following terms: **07**
1. Net requirements
 2. Gross requirements
 3. Planned order release
- (b) Explain the nature and role of the elements of the CIM system. **07**
