

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VIII (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2182002**Date: 02/05/2017****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.

- Q.1 (a)** Consider 8-DOF Robot manipulator shown in figure 1. Using D-H notation **07**
Construct
1. Set of robotic coordinate frame
 2. A table for joint parameter
 3. Each linear joint individual matrix



Figure 1. 8-DOF Robot manipulator

- (b)** Enlist the applications and characteristics of future industrial robots. **07**
- Q.2 (a)** Explain Cartesian and Polar configuration in robot **07**
- (b)** A frame A is rotated 90^0 about Z- axis, then translated 3 and 5 units relative to n- and o- axes respectively, then rotated another 90^0 about y-axis. Find the new location and orientation of the frame. **07**

$$A = \begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & -1 & 1 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

OR

- (b) A Cartesian robot with three linear motions has the traversing range of 50cm, 70cm and 90cm with the control memory of 8 bit, 10 bit and 12 bit storage capacity respectively. Determine the total control resolution of the robots work volume. **07**

- Q.3 (a)** Give the classification of sensors with example and their functions. **07**

- (b) The mechanical gripper in Fig.1 uses friction to grasp the part weighting 6kg. The coefficient of friction between the fingers and the part is 0.3, anticipated g factor is 2.0 and safety factor 1.5. Determine: **07**

- (i) The required gripping force to retain the part.
(ii) The actuation force that must be applied to achieve this gripping force for this mechanical design.

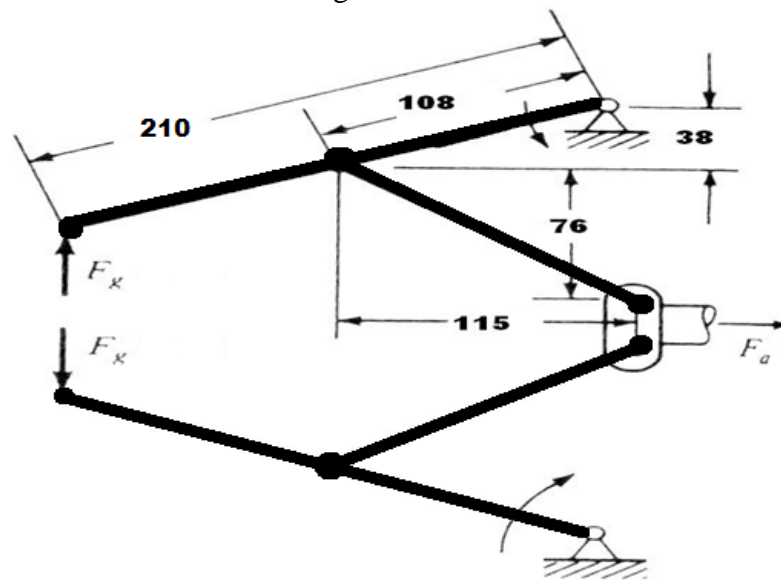


Fig.1 (All dimensions are in mm.)

OR

- Q.3 (a)** Discuss the programming methods used in robots mentioning their specific field in application. **07**

- (b) Explain a moving baseline tracking system and a stationary baseline tracking system in robot cell layout. **07**

- Q.4 (a)** Explain the following term in MRP-I **07**

1. Net requirements
2. Gross requirements
3. Planned order release
4. Schedule receipts
5. Planned-order receipts
6. Projected on hand

- (b) Basic Structure of the Opitz Parts Classification and Coding System. **07**

OR

- Q.4 (a)** "FMS is a sophisticated type of GT cell." Evaluate. In what aspects FMS is really flexible? **07**

- (b) Explain in briefly Quantitative analysis of flexible manufacturing systems **07**

- Q.5 (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 **07**

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
D	0.25	1	Load	1	4
		2	Drill	4	10
		3	H.Mill	2	15
		4	Unload	1	3

- (b) Differentiate between material requirement planning and capacity requirement planning. 07

OR

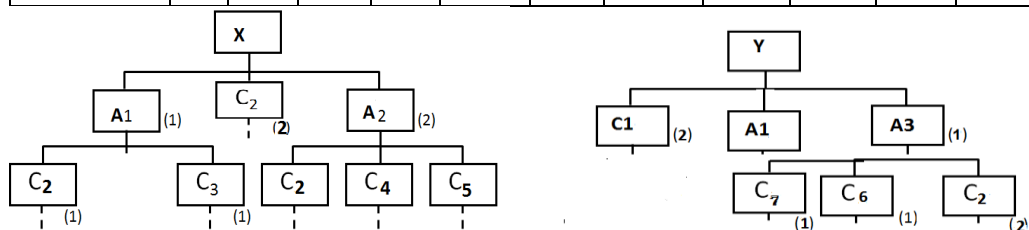
- Q.5 (a) ABC Mfg. Ltd. Manufactures two products, produce X and Y. The BOM of two product are shown in figure. Using MPS current inventory status and the product structure generate, the material requirement plan for the material C1 and C2. 07

Lead time are (in weeks)

X, Y, A2, A3,C1,C3,C4,C5,C6,C7 – one week and C2,A1 – two week

MPS

Week no.	10	11	12	13	14	15	16	17	18	19	20
Product P1			60		70		90		70		
Product P2			140			100		120		110	



- (b) What is CIM? Explain with neat sketch CIM wheel? 07
