Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII • EXAMINATION – SUMMER 2014

Subject Code: 182002 Date: 31-05-2014

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.**
4. **Draw neat diagrams. Shabbily drawn diagrams may not be awarded any credit.**

Q.1 **(a)** 1. Describe accuracy, repeatability, control resolution and spatial resolution for a robotic arm with the help of neat schematic diagrams. **04**

2. List out various robot drive systems and describe them briefly. **03**

(b) With the help of neat sketches discuss basic robot configurations and its applications. **07**

Q.2 **(a)** Name different sensors used with a robot to make it intelligent. Bring out the usefulness of theses sensors for various applications performed by robot. Describe briefly the robotic applications and role of the concerned robotic-sensors for those applications. **07**

(b) 1. Define the following terms: **04**
Work volume; Load carrying capacity; Speed of response and Stability

2. Evaluate: Direct kinematics gives unique solution for a given position in space, whereas inverse kinematics may not give unique solution for that same position. **03**

OR

(b) Find out the control resolution, spatial resolution and accuracy of two rotational joints of 2-DOF robot. The control system is built on 10 bits configuration. The limit of rotation of first joint is 200^0 and second joint is 270^0. The length of both of the links is 17 cm and mechanical inaccuracy in both the links is 0.001 cm. **07**

Q.3 **(a)** Differentiate amongst fixed automation, programmable automation and flexible automation. Support your answer with suitable examples to compare volume of production and product variety. **07**

(b) Derive equations of forward kinematics for 2-DOF planar robot manipulator using Denavit-Hartenerg representation. Assume the link lengths are *l* and *m* for the first and second link respectively. **07**

OR

Q.3 **(a)** Which are the different generations (or classes) of robots from intelligence point of view? Illustrate the difference amongst them with the help of suitable examples. **07**

(b) Derive equations of forward kinematics for 3-DOF planar robot manipulator. Denavit-Hartenerg representation **must not be used** for finding the equations of forward kinematics for this robot manipulator. Assume the link lengths are *l*, *m* and *n* for the first, second and third link respectively. **07**

Q.4 **(a)** 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

(b) Five machines will constitute a Group Technology cell. The From-To data for the machines are as follows. **07**

	To					
From	**Machine No.**	1	2	3	4	5
	1	0	10	80	0	0
	2	0	0	0	85	0
	3	0	0	0	0	0
	4	70	0	20	0	0
	5	0	75	0	20	0

Your Tasks:

(a) Determine the most logical sequence of machines for the given data, according to **From/To** ratio.

(b) Construct the balanced flow diagram to show the material flow. Find out the total number of material coming into the system and going out of the system.

OR

Q.4 **(a)** An ice-cream making factory needs to control the taste of different ice-cream flavors automatically. A robot manipulator is required to remain present to control the taste of different ice-creams. Provide a complete design requirement of the robot manipulator to control the taste of different ice-cream flavors. **07**

(b) Explain the working principle of absolute and incremental encoders for position control in automation. Support your response with neat sketches. **07**

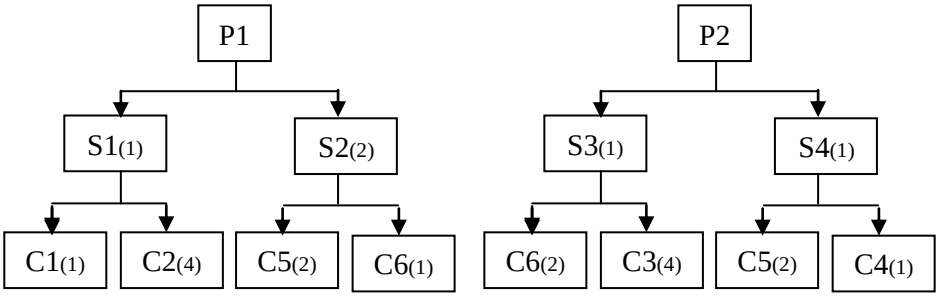
Q.5 **(a)** Explain with the help of block diagram various inputs of MRP (Material Requirement Planning). **07**

(b) Produce MRP for raw material M6, which is used to produce component C6. Two units of C6 are obtained from every unit of M6. Use the following information to solve the problem. **07**

Master Production Schedule:

Week No.	6	7	8	9	10
Product P1			60		110
Product P2		75	85	30	

Bill of Material:



Inventory and order status of M6:
Inventory on hand = 10; on order = 50 due for delivery in week 2.

Ordering and manufacturing lead times:
P1: assembly lead time = 1 week
P2: assembly lead time = 1 week
S2: assembly lead time = 1 week
S3: assembly lead time = 1 week
C6: manufacturing lead time = 2 weeks
M6: Ordering lead time = 2 weeks

OR

Q.5 **(a)** Bring out the concept of Computer Integrated Manufacturing (CIM) with the help of block diagram showing all the elements of CIM. **07**

(b) Discuss briefly various flexibilities available in Flexible Manufacturing System. **07**

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