Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – WINTER • 2014

Subject code: 1725002 **Date: 03-12-2014**

Subject Name: Computer-Integrated Manufacturing

Time: 02:30 pm - 05:00 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 CIM wheel and the meaning of CIM as suggested by CASA/SME. Is CIM a concept or a technology? **07**

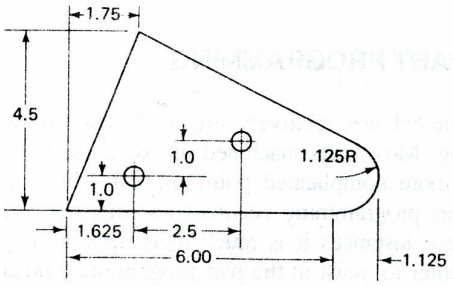
(b) Categorize the different types of manufacturing explaining each type clearly. **07**

Q.2 **(a)** Explain closed-loop control system used in an NC machine using a block diagram. State its benefits and drawbacks. **07**

(b) State the general characteristics of an industrial situation which tend to make the installation of a robot economical. What are the application areas for industrial robots in production premises? **07**

OR

(b) The following figure shows final geometry to be obtained from a workpiece which has previously been rough cut to this outline. The tool is a ½-in.-diameter end-milling cutter, cutting speed = 573 rpm, feed = 2.29 in./min. Prepare a manual part program. State where you find difficulty in this task and give an idea to overcome it. **07**



Dimensions are in inch

Q.3 **(a)** Explain the following NC motion control systems with figure: PTP, Straight cut, Contouring. **07**

(b) Show the general configuration of a DNC system and elaborate its four basic components. **07**

OR

Q.3 **(a)** Discuss the steps, in sequence, which must be accomplished to utilize numerical control in manufacturing. **05**

(b) A workpiece of a low-carbon steel plate has previously been cut out in the rough shape of the final part outline. The complete APT program to machine the periphery of the part is shown below. Write down as many technical details as you can, regarding machining data (tooling and cutting parameters/conditions) the programmer has chosen. Also draw the accurate final geometry of the part that would be obtained after NC machining using this program. Assume absolute positioning has been used and dimensions are in inch. **0□**

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Column
1      6   8   10
PARTNO         EXAMPLE PART
               MACHIN/MILL, 1
               CLPRNT
               INTOL/.001
               OUTTOL/.001
               CUTTER/.500
P0             POINT/0, -1.0, 0
P1             POINT/6.0, 1.125, 0
P2             POINT/0, 0, 0
P3             POINT/6.0, 0, 0
P4             POINT/1.75, 4.5, 0
L1             LINE/P2, P3
C1             CIRCLE/CENTER, P1, RADIUS, 1.125
L2             LINE/P4, LEFT' TANTO, C1
L3             LINE/P2, P4
PL1            PLANE/P2, P3, P4
               SPINDL/573
               FEDRAT/2.29
               COOLNT/ON
               FROM/P0
               GO/TO, L1, TO, PL1, TO, L3
               GORGT/L1, TANTO, C1
               GOFWD/C1, PAST, L2
               GOFWD/L2, PAST, L3
               GOLFT/L3, PAST, L1
               RAPID
               GOTO/P0
               COOLNT/OFF
               FINI
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Q.4 **(a)** Discuss the functions performed by the FMS computer control system category wise. **07**

(b) A flexible machining system consists of two machining workstations and a load/unload station. Station 1 is the load/unload station. Station 2 performs milling operations and consists of two servers (two identical CNC milling machines). Station 3 has one server that performs drilling (one CNC drill press). The stations are connected by a part handling system that has four work carriers. The mean transport time is 3.0 min. The FMS produces two parts, A and B. The part mix fractions and process routings for the two parts are presented in the table below. The operation frequency = 1.0 for all operations. Determine: (a) maximum production rate of the FMS, (b) corresponding production rates of each product, (c) utilization of each station, and (d) number of busy servers at each station. **07**

Part j	*Part Mix p_j*	*Operation k*	*Description*	*Station i*	*Process Time t_{ijk}(min)*
A	0.4	1	Load	1	4
		2	Mill	2	30
		3	Drill	3	10
		4	Unload	1	2
B	0.6	1	Load	1	4
		2	Mill	2	40
		3	Drill	3	15
		4	Unload	1	2

OR

Q.4	**(a)**	Write a note on: Types of AGVs and their applications.	**07**
	(b)	Discuss the various issues to be considered while (i) planning, (ii) designing, and (iii) operating an FMS.	**07**
Q.5	**(a)**	Explain the benefits a CIMS offers (any Five).	**05**
	(b)	A certain part is produced in a batch size of 100 units. The batch must be routed through five operations to complete the processing of the parts. Average setup time is 3 hr/operation, and average operation time is 6 min. Average non-operation time due to handling, delays, inspections, etc., is 7 hours for the complete batch for each operation. Determine how many days it will take to complete the batch assuming the plant runs one 8-hr shift/day.	**04**
	(c)	Define the following production concepts: Production capacity, Availability, Utilization, Manufacturing lead time, and Work-in-process.	**05**

OR

Q.5	**(a)**	Explain the meaning of the terms: data, information, database, signals, signaling, transmission, and DBMS.	**07**
	(b)	Explain the following types of communication lines with regard to CIM: (1) PTP connection, (2) multiplexing.	**07**

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