Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject code: 1725002 **Date: 18-06-2014**

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.**
4. **Abbreviations have usual meaning.**

Q.1 **(a)** Explain the CIM wheel to elucidate the meaning of CIM as suggested by CASA/SME. Is CIM a concept or a technology? **07**

(b) Classify production systems in detail. **07**

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

(b) What is an AGVS? Name three categories of it. What features distinguish self-guided vehicles from conventional AGVs? **07**

OR

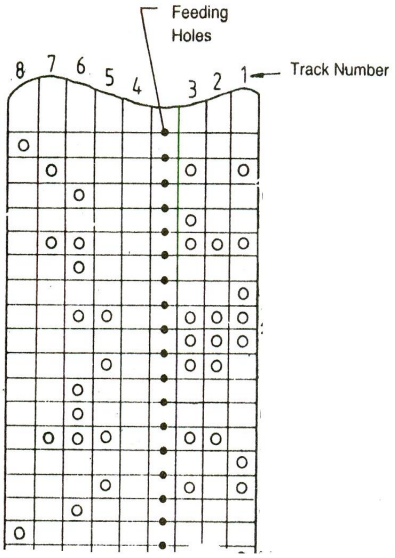
(b) What is the function of a CMM in an FMS applied for a machining system? Enlist the different types of construction of a CMM explaining any two with relative merit demerit. **07**

Q.3 **(a)** Discuss the problems inherent in conventional NC which motivated the development of CNC. **07**

(b) Explain the advantages of DNC over an NC or a CNC system. **07**

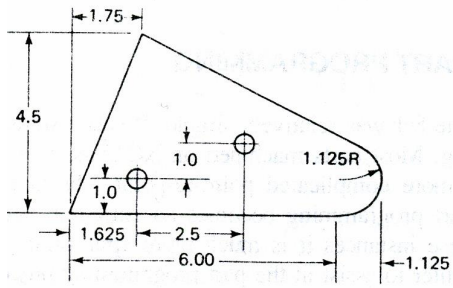
OR

Q.3 **(a)** **05**



The figure above shows a portion of an EIA coded program on a punched tape used on an NC machine. Tell what action will take place on the machine when it is read by a tape reader and executed.

(b) Write the complete APT program to machine the periphery of the part shown. The workpiece is a low-carbon steel plate, which has previously been cut out in the rough shape of the part outline. The tool is a ½-in.-diameter end-milling cutter. Typical cutting conditions might be recommended as follows: cutting speed = 573 rpm and feed = 2.29 in./min. The part is ½ in. thick. **09**



Dimensions are in inch

Q.4 **(a)** Discuss the types of FMS. Why is each FMS custom engineered or unique? **07**

(b) An FMS consists of four stations. Station 1 is a load/unload station with one server. Station 2 performs milling operations with three servers (three identical CNC milling machines). Station 3 performs drilling operations with two servers (two identical CNC drill presses). Station 4 is an inspection station with one server that performs inspections on a sampling of the parts. The stations are connected by a part handling system that has two work carriers and whose mean transport time = 3.5 min. The FMS produces four parts A, B, C, and D. The part mix fractions and process routings for the four parts are presented in the table below. Note that the operation frequency at the inspection station is less than 1.0 to account for the fact that only a fraction of the parts are inspected. Determine: (a) maximum production rate of the FMS, (b) corresponding production rate of each part, (e) utilization of each station in the system, and (d) the overall FMS utilization. **07**

Part j	*Part Mix p_j*	*Operation k*	*Description*	*Station i*	*Process Time t_{ijk} (min)*	*Frequency f_{ijk}*
A	0.1	1	Load	1	4	1.0
		2	Mill	2	20	1.0
		3	Drill	3	15	1.0
		4	Inspect	4	12	0.5
		5	Unload	1	2	1.0
B	0.2	1	Load	1	4	1.0
		2	Drill	3	16	1.0
		3	Mill	2	25	1.0
		4	Drill	3	14	1.0
		5	Inspect	4	15	0.2
		6	Unload	1	2	1.0
C	0.3	1	Load	1	4	1.0
		2	Drill	3	23	1.0
		3	Inspect	4	8	0.5
		4	Unload	1	2	1.0
D	0.4	1	Load	1	4	1.0
		2	Mill	2	30	1.0
		3	Inspect	4	12	0.333
		4	Unload	1	2	1.0

OR

Q.4 **(a)** Explain the features and capabilities of a horizontal machining centre which render it as a standard module for an FMS handling prismatic workpieces. **07**

(b) How would you define an AS/RS? Enlist its principal types stating distinguishing characteristic of each type. **07**

Q.5 **(a)** A production machine operates 80 hr /wk (two shifts, 5 days) at full capacity. Its production rate is 20 unit/hr. During a certain week, the machine produced 1000 parts and was idle the remaining time. (a) Determine the production capacity of the machine. (b) What was the utilization of the machine during the week under consideration? **04**

(b) The turret lathe section has six machines, all devoted to the production of the same part. The section operates 10 shift/wk. The number of hours per shift averages 8.0. Average production rate of each machine is 17 unit/hr. Determine the weekly production capacity of the turret lathe section. Modify your calculation if the availability and utilization of the machines are 90% and 80% respectively. **04**

(c) State true or false or do as directed: **06**

a. Cellular manufacturing is concerned with manufacture of products made of cellular materials.
b. FMS technology is limited to machining of metal components and their assembly.
c. COMPACT II is a software for material handling.
d. CNC software is another name for part programming.
e. APT is an acronym for _____.
f. Name three companies that produce and market machining centers.

OR

Q.5 **(a)** Explain the meaning of the terms data, database, DBMS, and RDBMS. What is the need of database for a manufacturing company? **07**

(b) Discuss different types of communications needed in a CIM environment. Which type forms the basis of all communications in CIM? **07**

****