Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME- SEMESTER II– EXAMINATION – SUMMER 2015

Subject Code: 2720815 **Date: 30/05/2015**

Subject Name: Computer Integrated Manufacturing

Time: 2:30 PM – 5:00 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)**	What is automation? Discuss basic elements of an automated system.	**07**
	(b)	Discuss different control functions used for automatic transfer machine.	**07**
Q.2	**(a)**	Sketch and explain Linear walking beam and Geneva wheel work part transfer mechanisms.	**07**
	(b)	A certain part is produced in a batch size of 100 units. The batch must be routed through five operations to complete processing of 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 each operation. Determine manufacturing lead time in days and production rate assuming the plant runs one 8-hr shift/day.	**07**
		OR	
	(b)	A 20-station transfer line is used to machine a component. The line will operate at a production rate of 50 pc/hr at 100% efficiency. Breakdowns of all types will occur with a frequency F = 0.10 breakdown/cycle and that average downtime per line stop will be 8.0 min. The starting casting that is machined on the line costs Rs. 180.00 per part. The line operates at a cost of Rs. 500.00/hr. The 20 cutting tools (one tool per station) last for 50 parts each, and average cost per tool = Rs 120.00 per cutting edge. Based on this data, compute: (a) production rate, (b) line efficiency and (c) cost per unit piece produced on the line.	**07**
Q.3	(a)	Explain vehicle guidance methods used in AGV for automated manufacturing systems.	07
	(b)	A roller conveyor follows a pathway 35 m long between production department and assembly department. Velocity of conveyor is 40 m/min. Parts are loaded into large tote pans, which are placed onto conveyor at load station in production department. Two operators work loading station. The first worker loads parts into tote pans, which takes 25 sec. Each tote pan holds 20 parts. Parts enter loading station from production at a rate that is in balance with this 25-sec cycle. The second worker loads tote pans onto conveyor, which takes only 10 sec. Determine: (a) spacing between tote pans along conveyor, (b) maximum possible flow rate in parts/min. and (c) minimum time required to unload tote pan in assembly department.	**07**
		OR	
Q.3	**(a)**	Discuss in brief the technologies used for automatic identification and data capture for automated manufacturing systems.	**07**
	(b)	Explain bar code technology with suitable diagrams for automated	**07**

manufacturing systems.

Q.4 **(a)** Sketch the layout of typical FMS and explain important subsystems. **07**

(b) A flexible machining system consists of two machining workstations and a load/unload station. Station 1 is 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 two parts are presented in table 1. The operation frequency f_{ijk} = 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**

OR

Q.4 **(a)** Enlist the common approaches for Computer Aided Process Planning (CAPP) and explain any one with suitable diagram. **07**

(b) Discuss benefits derived from CAPP. **07**

Q.5 **(a)** Discuss the concept of CIM wheel and state potential benefits of CIM. **07**

(b) Enlist various database models used in CIM and discuss relational database management system. **07**

OR

Q.5 **(a)** Discuss common prototype materials and its selection based on prototype fidelity. **07**

(b) Compare Selective Laser Sintering (SLS) and Fused Deposition Modeling (FDM) prototype processes.

Table 1

Part j	Part Mix p_i	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

****