Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME SEMESTER II EXAMINATION – SUMMER 2017

Subject Code: 2720815 **Date: 29/05/2017**

Subject Name: Computer Aided Manufacturing

Time:02:30 PM to 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 automated manufacturing systems with suitable examples. **07**

(b) Explain the ten strategies for Automation and Process improvement. **07**

Q.2 **(a)** A manual assembly line operates with a mechanized conveyor. The conveyor moves at a speed of 5 ft/min, and the spacing between base parts launched onto the line is 4 ft. It has been determined that the line operates best when there is one worker per station and each station is 6 ft long. The repositioning efficiency is 0.96. Determine: (1) feed rate and corresponding cycle time, (2) tolerance time for each worker, (3) ideal minimum no. of workers on the line. (4) Draw the precedence diagram for the problem. (5) Determine line balancing solution by Ranked Positional Weight method. (6) Determine the balance delay for your solution. **07**

Element	T_e (min)	Preceded by	Element	T_e (min)	Preceded by
1	0.2	-	8	0.2	5
2	0.5	-	9	0.4	5
3	0.2	1	10	0.3	6,7
4	0.6	1	11	0.1	9
5	0.1	2	12	0.2	8,10
6	0.2	3,4	13	0.1	11
7	0.3	4	14	0.3	12,13

(b) Explain the work part transfer mechanism for automated flow lines. **07**

OR

(b) List the functions of parts delivery at work stations and explain the hardware used for the parts delivery system. **07**

Q.3 **(a)** Explain the vehicle guidance technology for AGVS. **07**

(b) Explain Radio frequency identification method for Automated inspection. **07**

OR

Q.3 **(a)** The oval rail of a carousel storage system has length – 12m and width – 1m. There are 75 carriers equally spaced around the oval. Suspended from each carrier are six bins. Each bin has volumetric capacity – 0.026m^3. Carousel speed – 20m/min. Average P&D time for a retrieval – 20sec. Determine: (1) volumetric efficiency of the storage system and (2) hourly retrieval rate of the storage system. **07**

(b) Explain the conveyer system for the automated material handling. **07**

Q.4 **(a)** Describe the steps of retrieval CAPP system. State the importance of GT in retrieval CAPP. **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. Station 3 performs drilling operations with two servers. 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 – 3.5min. 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: (1) maximum production rate of the FMS, (2) corresponding production rate of each part, (3) utilization of each station in the system and (4) the overall FMS utilization. **07**

Part j	Part Mix P_j	Op^n. 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)** For the data given in Q.4 (b) (above) determine how many servers at each station i will be required to achieve an annual production rate 60,000 parts/yr. The FMS will operate 24 hr/day, 5 day/wk, 50 wk/yr. Anticipated availability of the system is 95%. Also for the specified production rate determine: (a) the utilizations for each station and (b) the maximum possible production rate at each station if the utilization of the bottleneck station were increased to 100%. **07**

(b) Define the generative CAPP and explain the procedure to implement the same. **07**

Q.5 **(a)** Explain the STL file errors in rapid prototyping. **07**

(b) List and explain the computerized elements of a CIM system. **07**

OR

Q.5 **(a)** Explain how CIM can be implemented in manufacturing industry. **07**

(b) Explain the Laminated- object Manufacturing in rapid prototyping. **07**

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