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10ME61

Sixth Semester B.E. Degree Examination, Aug./Sept.2020
Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Derive a relation for computing manufacturing lead time for a batch production situation. State the assumptions. **(06 Marks)**

b. Distinguish between Production Rate and Plant Capacity. **(04 Marks)**

c. There are nine machines in a machine shop. Average set up time for these machines is 6 hours. The average batch size of parts processed in this shop is 90. The average operation time is 8.0 min. An operator is permitted to operate 3 machines. There are 3 operators in the shop for 9 machines. There are two setup operators who perform machine setup exclusively. The shop runs one 8 hour shift per day, 6 days per week. An average of 15% of the production is lost due to machine breakdowns. Scrap losses are negligible. As per production control manager capacity of the shop is 1836 parts per week. However actual output averages only 1440 parts/week. What is the problem? Recommend a solution. **(10 Marks)**

2 a. Write a note on pallet fixtures. **(04 Marks)**

b. Distinguish between instantaneous control and memory control. **(06 Marks)**

c. A rotary worktable is driven by a Geneva mechanism with six slots. The drives rotates at 12 RAM. Determine (i) Cycle time (ii) Available process time (iii) Index time (iv) Angle of rotation of drives for indexing and processing. **(10 Marks)**

3 a. An 8-station rotary indexing machine operates with an ideal cycle time of 20 seconds. The frequency of line stop occurrences is 0.06 stop per cycle. When stop occurs, it takes an average of 3 mins to repair. Determine

(i) Average production time
(ii) Average production rate
(iii) Line efficiency
(iv) Proportion of Downtime.

If the costs associated with the operation of the indexing machine are as follows:

(i) Cost of Raw work part Rs. 25 per part
(ii) Cost of operating line Rs. 40 per min
(iii) Cost of disposable tooling Rs. 15 per part

Compute the average cost per part produced in the rotary indexing machine. **(10 Marks)**

b. In a 12 station in-line transfer machine probability of line stop for all stations is 0.01 (equal proportion of failure). Cycle time is 0.3 min and down time for repair is 3 mins. Using lower bound and upper bound approaches compute.

(i) F frequency of line stops.
(ii) R_p average production rate
(iii) Line efficiency E
(iv) Proportion downtime D. **(10 Marks)**

4 a. Work elements, their times and precedence constraints of an assembly line as following.

Element	Time (min)	Preceded by
1	04	-
2	07	1
3	05	1
4	08	2
5	10	2, 3
6	02	3
7	03	4
8	09	4, 9
9	03	5, 6
10	05	7, 8

Assuming 5-work stations, compute balance delay.
(i) Draw precedence diagram
(ii) Using ranked positional weight method balance the line and compute balance delay. **(12 Marks)**

b. Using largest candidate rule method balance the line and calculate balance delay for the above problem in Q4(a). **(08 Marks)**

PART – B

5 a. Explain the methods adopted in Traffic control of AGVs. **(06 Marks)**

b. With a neat sketch explain the analysis of multi-station assembly machine. **(06 Marks)**

c. An auto-guided vehicle has an average travel distance of 200m/delivery and an average empty travel distance of 150m. The load and unload times are 24 sec each and the speed of AGV is 1 m/sec. Traffic factor is 0.9. How many vehicles are needed to satisfy a delivery requirement of 30 deliveries per hour? Assume an availability of 0.95 and Wankel efficiency of 1.0 . **(08 Marks)**

6 a. What are the two approaches to computer aided process planning? With the help of a block diagram explain any one of them. **(10 Marks)**

b. With the help of a block diagram, explain the various activities in a typical computerized manufacturing planning system. **(10 Marks)**

7 a. Prepare a manual part program to machine the component shown in Fig.Q7(a) below, using an end mill of 20mm diameter and "without using cutter compensation codes". Show the tool path and write comments for each block. The program should be complete in all respects. Assume suitable speed feed and depths.

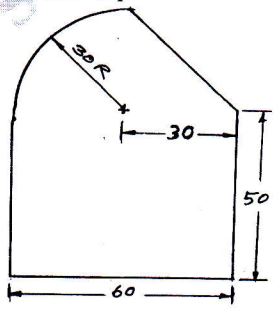

Fig.Q7(a) **(12 Marks)**

b. Distinguish between with appropriate sketches :
   (i) Straight-cut CNC and contouring CNC system.
   (ii) Open-loop and closed loop CNC system. **(08 Marks)**

8 a. With the help of a neat sketch, illustrate 6 degrees of freedom of a TRL:TRR Robot. Name the configuration of this Robot. **(08 Marks)**
b. Discuss the use of various sensors in an industrial robot. **(06 Marks)**
c. Distinguish between Walk-through and Lead-through programming of a Robot. Briefly explain Lead through programming method. **(06 Marks)**

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