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10ME61

Sixth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Computer Integrated Manufacturing

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Discuss the relationship between automation and computer integrated manufacturing. **(05 Marks)**

b. The parts produced in a batch manufacturing plant must be processed through an average of six machines. There are 20 new batches of parts launched each week. Other data are as follows:

Average operation time : 6 minutes
Average set up time : 5 hours
Average non-operation time : 600 minutes
Average batch size : 50 parts

There are 24 machines in the plant, and the plant operates 70 hours per week. Determine: i) Manufacturing lead time; ii) Plant capacity; iii) Work in progress; iv) Plant utilization. **(10 Marks)**

c. One million parts are to be manufactured in a plant which runs 6 hours per day, 5 days per week and 50 weeks per year. Calculate number of machines required to keep up the demand if the cycle time is 0.6 mins. Also calculate machine utilization. **(05 Marks)**

2 a. Discuss the reasons for implementing buffer storage. **(04 Marks)**

b. Distinguish between instantaneous control and memory control. **(04 Marks)**

c. Write a note on pallet fixture. **(04 Marks)**

d. The driver of a six slotted Geneva mechanism rotates at two RPM. Determine: i) Cycle time; ii) Available process time; iii) Indexing time and iv) Angle of rotation of drives for indexing. **(08 Marks)**

3 a. Derive a relation to compute production rate using lower-bound approach. **(05 Marks)**

b. A 10-station transfer machine has an ideal cycle time of 1 minute. Station breakdowns occur with a probability of F = 0.10 breakdowns/cycle. Average downtime is 5 minutes per line stop. Raw material for the component manufactured in this line costs Rs.150/unit and it costs Rs.100/ per min to operate the line. Cutting tools are estimated to cost Rs.15 per work part. Considering a scrap rate of 10%. Compute: i) Production rate; ii) Number of hours required to meet the demand of 1500 units/week; iii) Line efficiency and down time; iv) Cost per unit. **(15 Marks)**

4 a. The following list defines the precedence relationships and element times for a new product. Using ranked positional weight (RPW) method balance the line.

i) Construct precedence diagram.
ii) Calculate balance delay.
Assume an ideal cycle time of 10min. **(10 Marks)**

Element	1	2	3	4	5	6	7	8	9	10
Time Te (min)	5	3	8	2	2	6	4	5	3	6
Immediate predecessor	-	1	1	2	2	3	4 & 5	3 & 5	7 & 8	6 & 9

b. In a plant a product is assembled as per the follow data:

Element	1	2	3	4	5	6	7	8
Time Te(min)	10	5	8	3	11	3	5	15
Immediate predecessor	-	-	1, 2	2	3	3, 4	4	5, 6 & 7

Using largest candidate rule balance this assembly line.

i) Construct precedence diagram.

ii) Calculate balance delay if the ideal cycle time is 16 min. **(10 Marks)**

PART – B

5 a. An AGV has an average travel distance of 450m per delivery. The system must be capable of making 40 deliveries/hour. The following data specifies the performance requirement:

i) Vehicle velocity 150m/min

ii) Pick up time 45 seconds

iii) Drop-off time 45 seconds

iv) Average empty travel distance = 300m

v) Traffic factor 0.90.

Calculate number of AGVs needed to satisfy the delivery requirements and system efficiency. **(08 Marks)**

b. A 10-station in-line assembly machine has 6s ideal cycle time. The base part is automatically loaded prior to the first station and components are added at each station. The fraction defect rate at each of 10 stations is 0.01 and probability that a defect will jam is 0.5. When jam occurs average down-time is 2min. Determine average production rate, yield of good assemblies and uptime efficiency of the assembly machine. **(08 Marks)**

c. Briefly explain AGVs system management function. **(04 Marks)**

6 a. With a block diagram, explain the retrieval type computer aided process planning systems. **(10 Marks)**

b. With a block diagram explain the structure of bill of material for a product. **(06 Marks)**

c. List the MRP output reports. **(04 Marks)**

7 a. Write a part program for the component shown in Fig.Q.7(a). The program should be complete with comments for each block. (All dimensions are in mm). **(12 Marks)**

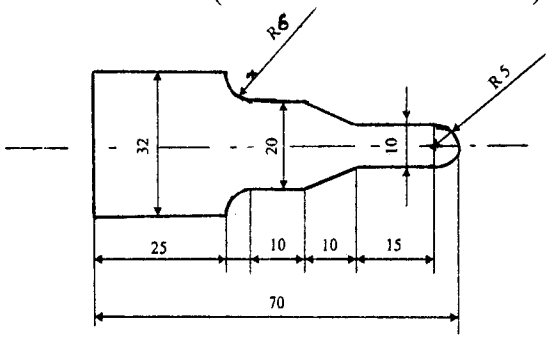

Fig.Q.7(a)

b. Briefly explain the following NC codes: i) G40, G41 and G42 ; ii) G70, G71 and G72. **(08 Marks)**

8 a. Draw a neat sketch of a TRL-TTR robot showing all six degrees of freedom and explain it briefly. **(08 Marks)**

b. Explain the terms: i) Spatial resolution, ii) Accuracy and iii) Repeatability with reference to precision of a robot. **(06 Marks)**

c. Differentiate between walk through and lead-through programming of a robot. **(06 Marks)**

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