

Code No: D0407, D5210

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M.TECH II - SEMESTER EXAMINATIONS, APRIL/MAY 2012****AUTOMATION IN MANUFACTURING****(COMMON TO CAD/CAM, DESIGN FOR MANUFACTURING)****Time: 3hours****Max. Marks: 60**

**Answer any five questions**  
**All questions carry equal marks**

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- 1.a) What is automation ? Discuss the basic principles of automation.
- b) Explain the terms MLT, Production Rate, Utilization and availability.
  
- 2.a) Define the configuration of an automated flow line. Discuss the two configurations of automated flow line and their selection.
- b) With neat diagrams explain the functioning of various types of Transfer Mechanisms.
  
3. An eight station rotary indexing machine operates with an ideal cycle time of 20s. The frequency of line stop occurrences is 0.06 stop/cycle on the average. When a stop occurs, it takes an average of 3 min to make repairs. Determine the following:
  - (i) Average production time  $T_p$
  - (ii) Average production rate  $R_p$
  - (iii) Line efficiency  $E$
  - (iv) Proportion of downtime  $D$ .
  
4. A proposal has been submitted to replace a group of assembly workers, each working individually, with an assembly line. The following table gives the individual work elements.

Element	$T_e$ (min)	Immediate predecessors
1	1.0	----
2	0.5	----
3	0.8	1, 2
4	0.3	2
5	1.2	3
6	0.2	3, 4
7	0.5	4
8	1.5	5, 6, 7

The demand rate for this job is 1600 units/week (assume 40 h/week) and the current number of operators required to meet this demand is eight using the individual manual workers.

- a) Construct the precedence diagram from the data provided on work elements.
- b) Use the largest-candidate rule to assign work elements to stations. What is the Balance delay for the solution?
- c) The initial cost to install the assembly line is Rs.20,000. If the hourly rate for workers is Rs. 5.00/h, will the assembly line be justified using a 3-year service life? Assume 50 weeks/year. Use a rate of return = 10%.

- 5.a) Discuss the various principles of material handling.
- b) Explain the quantitative relationships and analysis of conveyor systems.
  
- 6.a) What is plant layout? Discuss the various types of plant layout with examples.
- b) Describe the analysis of transfer lines without storage using upper-bound and Lower-bound approach.
  
- 7.a) The cycle time for a given assembly work head = 0.2 minute. The parts feeder has a feed rate = 20 components/min. The probability that a given component fed by the feeder will pass through the selector is  $\theta = 0.3$ . The number of parts in the feed track corresponding to the low-level sensor is  $n_{f1} = 6$ . The capacity of the feed track is  $n_{f2} = 18$  parts.
  - (i) Determine how long it will take on average for the supply of parts in the feed track to go from  $n_{f2}$  to  $n_{f1}$ .
  - (ii) Determine how long it will take on average for the supply of parts for parts to go from  $n_{f1}$  to  $n_{f2}$ .
- b) What is an AGV? Classify different types of AGV's.
  
- 8. Write short notes on the following:
  - a) Automation strategies
  - b) Computer simulation of automated flow lines
  - c) Carousel storage systems.

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