Code No: C8003 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH I – SEMESTER EXAMINATIONS, APRIL/MAY-2012
AUTOMATION IN MANUFACTURING
(MECHATRONICS)

Time: 3hours **Max. Marks: 60**

Answer any FIVE questions
All questions carry equal marks
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1.a) Define automation. Classify different types of automation and discuss the important reasons for automation.
b) Discuss the effect of automation on manufacturing lead time and work in-process inventory.

2.a) Explain about various principles of material handling.
b) What is an AGV? Classify different types of AGV's.

3.a) Discuss the fundamentals of manual assembly lines.
b) The total work content time of a certain assembly is 7.8 minutes. The estimated down time of the line is D = 5%, and the required production rate is R_P = 80 units/hour.
i) Determine the theoretical minimum number of workstations required to optimize the balance delay and (ii) For the number of stations determined in part (i), compute the balance delay *d*. (iii) What feed rate should be specified if a moving belt line is to be used?

4.a) Discuss the analysis of automated flow lines without storage buffers.
b) In the operation of a certain 15-station transfer line, the ideal cycle time is 0.58 min. Breakdowns occur at a rate of once every 10 cycles, and the average downtime per breakdown ranges between 2 and 9 minutes, with an average of 4.2 min. The plant in which the transfer line is located works an 8-h day, 5 days per week. How many parts will the line be capable of producing during an average week?

5.a) With neat diagrams explain various types of parts feeding devices in an automated assembly systems.
b) The cycle time for given assembly workhead = 0.2 min. 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 θ = 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} = 18parts.(a)Determine how long it will take for the supply of parts in the feed track to go from n_{f2} to n_{f1}. (b) Determine how long it will take on average for the supply for parts to go from n_{f1} to n_{f2}.

6. The following list defines the precedence relationships and element times for a new model toy:

Element	T (Minutes)	Immediate predecessors
1	0.5	---
2	0.3	1
3	0.8	1
4	0.2	2
5	0.1	2
6	0.6	3
7	0.4	4, 5
8	0.5	3, 5
9	0.3	7, 8
10	0.6	6, 9

Determine the assignment of work elements to stations using the Kilbridge and Wester method. Also calculate (a) How many stations are required? and (b) Compute the balance delay.

7. The average part produced in a certain batch manufacturing plant must be processed through an average of six machines. There are 20 new batches of parts launched each week. Other pertinent data are as follows: average operation time = 6 min., average setup time = 5 h, average batch size = 25 parts, average non-operation time per batch = 10 h.
There are 18 machines in the plant. The plant operates an average of 70 production hours per week. Scrap rate is negligible.
(a) Determine the MLT for an average part. (b) Determine the plant capacity
(c) Determine the plant utilization and (d) How would you expect the nonoperation time to be affected by the plant utilization?

8. Write short notes on the following:
   a) Automation strategies
   b) Ranked Positional Weights method
   c) Design for automated assembly assembly.

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