Code No: **RT41039** **R13** Set No. 1

IV B.Tech I Semester Regular Examinations, November - 2016
AUTOMATION IN MANUFACTURING
(Mechanical Engineering)

Time: 3 hours   Max. Marks: 70

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any THREE questions from Part-B
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PART–A *(22 Marks)*

1. a) List out the advantages of automation.   [4]

    b) What are two reasons for the existence of partially automated production lines?   [4]

    c) Name some line balancing methods.   [3]

    d) Define Monorail and conveyer.   [4]

    e) List out the advantages of Adaptive control.   [4]

    f) What is inspection?   [3]

PART–B *(3x16 = 48 Marks)*

2. a) What is automation? Discuss various types of automation.   [8]

    b) List various mechanical feeding devices. Explain any one with neat sketch.   [8]

3. a) Discuss the various control functions of an automated transfer line.   [8]

    b) A Geneva with six slots is used to operate the work table of a dial-indexing
        machine. The slowest workstation on the dial-indexing machine has an operation
        time of 2.5 sec, so the table must be in a dwell position for this length of time.
        i) At what rotational speed must the driven member of the Geneva mechanism
           be turned to provide this dwell time?   [8]
        ii) What is the indexing time each cycle?

4.   A six-station automatic assembly line has an ideal cycle time of 12 sec. Downtime occurs for two reasons. First, mechanical and electrical failures cause line stops that occur with a frequency of once per 50 cycles. Average downtime for these causes is 3 min. Second, defective components also result in downtime. The fraction defect rate of each of the six components added to the base part at the six stations is 2%. The probability that a defective component will cause a station jam is 0.5 for all stations. Downtime per occurrence for defective parts is 2 min. Determine

    i) yield of assemblies that are free of defective components,

   ii) proportion of assemblies that contain at least one defective component,

  iii) average production rate of good product, and

  iv) uptime efficiency.   [16]

5. a) Explain any two material handling equipment with neat sketches.   [8]

    b) Briefly describe the basic components of AS/RS.   [8]

6. a) What do you mean by adaptive control? Explain two types of adaptive control.   [8]

    b) List out the various operation parameters that can be measured in turning operation to use in adaptive control systems.   [8]

7. a) Differentiate contact and non-contact inspection.   [8]

    b) Explain the working of Co-ordinate Measuring Machine with neat sketch.   [8]

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Set No. 2

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Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
*Answer any THREE questions from Part-B*
*****

PART–A *(22 Marks)*

1. a) Explain about flexible automation. [4]

    b) Name three reasons for including a storage buffer in an automated production line? [4]

    c) What are the four automated assembly system configurations? [3]

    d) Name various types material handling equipment. [4]

    e) Define adaptive control constraints. [4]

    f) Write the functions of CMM [3]

PART–B *(3x16 = 48 Marks)*

2. a) List six basic components required in a hydraulic fluid system and state their essential functions. [8]

    b) Discuss various types of automation strategies mentioning their importance. [8]

3. a) Explain about geneva Mechanism. [8]

    b) A ten-station transfer machine has an ideal cycle time of 30 sec. The frequency of line stops is 0.075 stops per cycle. When a line stop occurs, the average downtime is 4.0 min. Determine

         (i)   average production rate in pc/hr,
         (ii)   line efficiency, and
         (iii) proportion downtime [8]
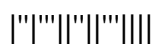
4.   The following table defines the precedence relationships and element terms for new model toy.

   i) Construct the precedence diagram for this job

   ii) If the ideal cycle time = 1.1min. repositioning time 0.1 min and up time proportion is assumed to be 1.0, what is the theoretical minimum number of work station required to minimize the balance delay under the assumption that there will be one worker per station?

   iii) Using Ranked Positional Weights method, assign work elements to stations compute balance delay.

Work Element No.	T_e (Min)	Immediate Predecessor
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

[16]

5. a) Discuss the applications of AS/RS.   [8]

   b) An automated guided vehicle system has an average travel distance per delivery = 200 m and an average empty travel distance = 150 m. Load and unload times are each 24 s and the speed of the AGV = 1 m/s. Traffic factor = 0.9. How many vehicles are needed to satisfy a delivery requirement of 30 deliveries/hour? Assume that availability = 0.95.   [8]

6.   What is the objective of Adaptive Control with Constraints? Draw the block diagram of a typical computerized Adaptive Control with Constraints system for drilling operation and explain in detail.   [16]

7. a) Explain the working of machine vision with neat sketch.   [8]

   b) Discuss briefly about the construction of Coordinate measuring machine.   [8]

Code No: **RT41039**   **R13**   Set No. 3

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Time: 3 hours   **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
*Answer any THREE questions from Part-B*
*****

PART–A *(22 Marks)*

1. a) Differentiate between fixed automation and Programmable automation.   [4]
    b) Explain about upper bound approach.   [3]
    c) Trace out the importance of precedence diagram in the line balancing.   [4]
    d) Name the four traditional (non-automated) methods for storing materials.   [3]
    e) State the principal difference between adaptive control system and conventional closed loop control system.   [4]
    f) What is the difference between off-line inspection and on-line inspection?   [4]

PART–B *(3x16 = 48 Marks)*

2. a) Define the following terms used in mass production.
        (i) flexible automation
        (ii) Production rate
        (iii) Plant capacity   [8]
    b) What are the important pneumatic components used in automated system? Describe briefly.   [8]

3. a) Mention the objectives of automated flow line and discuss about in-line and rotary type configuration lines.   [8]
    b) Explain the analysis of transfer lines without storage.   [8]

4. a) Define the following performance measures related to line balancing
        i) Line efficiency
        ii) Balancing efficiency
        iii) Repositioning efficiency   [8]
    b) Explain the largest candidate rule.   [8]

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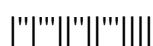
5. a) An overhead trolley conveyor is configured as a continuous closed loop. The delivery loop has a length of 120 m and the return loop = 80 m. All parts loaded at the load station are unloaded at the unload station. Each hook on the conveyor can hold one part and the hooks are separated by 4 m. Conveyor speed = 1.25 m/s. Determine

    i) maximum number of parts in the conveyor system,
    ii) parts flow rate; and
    iii) maximum loading and unloading times that are compatible with the operation of the conveyor system? [8]

    b) Write the function of following material handling equipment.

    i) Industrial trucks
    ii) Pallet trucks
    iii) Roller conveyer [8]

6. a) Differentiate between ACO and ACC types of adaptive control. [8]

    b) Explain the adaptive control for grinding operation with block diagram. [8]

7. Explain different types of CMM with neat sketch. [16]

Code No: **RT41039**   **R13**   Set No. 4

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Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any THREE questions from Part-B
*****

PART–A *(22 Marks)*

1. a) List out the components in Pneumatic system.   [3]

    b) What is a dial-indexing machine?   [4]

    c) What is precedence diagram? Give the significance of precedence diagram.   [4]

    d) What are the four basic components of nearly all automated storage/retrieval   [4]
        systems?

    e) Define Adaptive control.   [3]

    f) What are the four steps in a typical inspection procedure?   [4]

PART–B *(3x16 = 48 Marks)*

2.   List out various mechanical feeding devices. Explain any two with neat sketch   [16]

3. a) With neat diagrams explain the functioning of various types of Transfer   [8]
        Mechanisms.
    b) Calculate the line efficiency for a transfer line with one storage buffer. The line   [8]
        has10 workstations, each with a probability of breakdown of 0.02. The cycle
        time of the line is 1 min. and each time a breakdown occurs, it takes exactly 5
        min. to make repairs. The line is to be divided into two stages by a storage bank
        so that each stage will consist of five stations. Compute the efficiency of the
        two-stage line for various buffer capacities.

1 of 2

4. A manual assembly is to be designed to make a small consumer product. The work element, their times, and precedence constraints are given in the table below. A worker will operate the line for 400 min/day and must produce 300 products/day. A mechanized belt moving at a speed of 1.25 /min will transport the products between stations. Because of the variability in the time required to perform the assembly operations, it has been determined that the tolerance time should be 1.5 times the cycle of the line.

    i)   Determine the ideal minimum number of workers on the line
    ii)   Use kilbridge and wester method to balance the line
    iii)   Compute the balance delay.

Element	T_e (min)	Preceded by
1	0.4	--
2	0.7	1
3	0.5	1
4	0.8	2
5	1.0	2,3
6	0.2	3
7	0.3	4
8	0.9	4,9
9	0.3	5,6
10	0.5	7,8

[16]

5. a) Discuss in detail the various steps involved in design of automated guided vehicle system. [8]

   b) Explain the various problems encountered in interfacing handling and storage systems with manufacturing units. [8]

6 Draw the block diagram of a typical computerized Adaptive Control with Constraints system for milling process. Explain in detail. [16]

7. Write short notes on following:
   i) Contact inspection Vs Non contact inspection [6]
   ii) Construction of CMM [5]
   iii) Types of illumination in Machine vision [5]