K.RAMAKRISHNAN
COLLEGE OF TECHNOLOGY
An Autonomous Institution
Affiliated to Anna University Chennai, Approved by AICTE New Delhi,
ISO 9001:2015 & ISO 14001:2015 Certified Institution, Accredited with 'A+' grade by NAAC
Samayapuram, Tiruchirappalli – 621 112, Tamilnadu, India.

**Department of Mechanical Engineering**
(NBA Accredited)

# Question Bank

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|---|---|---|
| Semester | : | VII |
| Subject Code | : | OAN751 |
| Subject Name | : | LOW COST AUTOMATION |
| Regulations | : | R2017 |
| Academic Year | : | 2021 – 2022 |
| Prepared By | : | A. Godwin Antony<br>K.Rajaguru |

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## UNIT-I : AUTOMATION OF ASSEMBLY LINES

**Syllabus :** Concept of automation - mechanization and automation - Concept of automation in industry - mechanization and automation - classification, balancing of assembly line using available algorithms - Transfer line-monitoring system (TLMS) using Line Status - Line efficiency - Buffer stock Simulation in assembly line.

**Objectives:** To give basic knowledge about automation
To understand the basic hydraulic and pneumatic systems for automation
To understand the assembly automation.

Outcomes: To give basic knowledge about automation process in industries and its efficiency calculations (K5)

## PART-A

| *S.No.* | *Questions* | *Knowledge Level* | *Competence* |
|---|---|---|---|
| 1 | What is automation? | K1 | Remember |
| 2 | Explain Mechanization. | K2 | Understand |
| 3 | Classify the automation process in detail. | K4 | Analyze |
| 4 | Classify Mechanization And Automation. | K4 | Analyze |
| 5 | What is the balancing of the Assembly line? | K1 | Remember |
| 6 | What is a transfer line monitoring system? | K1 | Remember |
| 7 | What is buffer storage? | K1 | Remember |
| 8 | Write any 5 terms used in line balancing. | K3 | Apply |
| 9 | Explain the term bottleneck. | K2 | Understand |
| 10 | Write any four operation research technique used in line balancing. | K3 | Apply |
| 11 | Explain Geneva mechanism. | K2 | Understand |
| 12 | What are the basic elements of an automated system? | K1 | Remember |
| 13 | Outline the objectives of Line balancing. | K2 | Understand |
| 14 | Define the types of line balancing. | K1 | Remember |
| 15 | What is the formula for calculating the line efficiency? | K1 | Remember |
| 16 | What are the limitations of line balancing? | K1 | Remember |
| 17 | What are the limitations of automation? | K1 | Remember |
| 18 | List the different ways to improve line balance. | K1 | Remember |
| 19 | Define line balancing. | K1 | Remember |

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|---|---|---|---|
| 20 | What is Cycle time, Lead time and Bottleneck? | K1 | Remember |
| 21 | What is Task precedence, Takt time and downtime? | K1 | Remember |
| 22 | List the downtime or waste activities. | K1 | Remember |
| 23 | Explain an unbalanced line. | K2 | Understand |
| 24 | What are the types of workpart Transport systems? | K1 | Remember |
| 25 | Brief Asynchronous transfer. | K1 | Remember |
| 26 | Define Starving in the production line. | K1 | Remember |
| 27 | Define blocking in the production line | K1 | Remember |
| 28 | Explain Fixed Automation. | K5 | Evaluate |
| 29 | Define Programmable Automation. | K1 | Remember |
| 30 | Illustrate an example of Flexible Automation | K2 | Understand |
| 31 | List the reasons for Automation. | K1 | Remember |
| 32 | List the inputs required for the manufacturing process. | K1 | Remember |
| 33 | List out the principal types of plant Layout | K1 | Remember |
| 34 | Classify the types of transfer mechanisms. | K2 | Understand |
| 35 | Recall the types of Rotary transfer mechanisms | K1 | Remember |
| 36 | Recall types of Linear transfer mechanism: | K1 | Remember |
| 37 | Tell the control strategies of the automatic transfer system. | K1 | Remember |
| 38 | Define Assembly and types of joining methods. | K1 | Remember |
| 39 | Spell out the constraints for assembly line balancing. | K1 | Remember |
| 40 | Label the benefit of line balancing. | K1 | Remember |

## PART-B

| ***S.No.*** | ***Questions*** | ***Mapping*** | |
|---|---|---|---|
| 1 | Explain automation briefly. | K2 | Understand |
| 2 | Explain the Elements of an Automated System. | K2 | Understand |
| 3 | Recall the terms and steps involved in line balancing. | K1 | Remember |
| 4 | Categorize the types of Automation process. | K4 | |
| 5 | Explain transfer line monitoring system. | K5 | Evaluate |
| 6 | Explain in brief Continuous Transfer System and Synchronous transfer system. | K5 | Evaluate |
| 7 | Explain in brief Asynchronous transfer system and Stationary base part system. | K5 | Evaluate |
| 8 | Summarize functions of automation information processing in manufacturing. | K2 | Understand |
| 9 | Discuss in detail about the various reasons for Automation with advantages & disadvantages. | K6 | Create |
| 10 | Elaborate the different Automation Strategies followed in industry. | K6 | Create |
| 11 | Identify the different inputs required for the manufacturing process and discuss their significance. | K3 | Apply |
| 12 | Elaborate the importance of Plant Layout. Discuss the different plant layouts followed in the automated company. | K6 | Create |
| 13 | Interpret the meaning of Linear transfer mechanism. | K2 | Understand |
| 14 | Explain in detail the Rotary transfer mechanism followed in the automation process. | K5 | Evaluate |

| | | | |
|---|---|---|---|
| 15 | Explain different types of linear transfer systems. | K5 | Evaluate |
| 16 | Outline the different segmented in-line configuration with neat sketches. | K2 | Understand |
| 17 | List & explain the various elements of the parts delivery system | K5 | Evaluate |
| 18 | Elaborate the Buffer storage system with a neat sketch. | K6 | |
| 19 | Compare the various control strategies to control the operation of automatic transfer systems. | K5 | Evaluate |
| 20 | A transfer machine with 12 stations has an ideal cycle time of 39 seconds. The frequency of line stops is 0.085 stops per cycle. When a line stop occurs, the average downtime is 5.5 minutes. Evaluate (a) average production rate in parts per hour, (b) line efficiency, and (c) proportion downtime. | K5 | Evaluate |

## PART-C

| *S.No.* | *Questions* | *Mapping* | |
|---|---|---|---|
| 1 | An assembly consists of the following elements. Production rate required is one assembly every 20 min. Determine the minimum number of workstations required so as to minimize the balance delay. find balance delay station wise. | K5 | Evaluate |

| Task | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Predecessor | - | A | B | B | B | B | C,D | G | E | I,F | H,J | K |
| Task time | 12 | 6 | 6 | 2 | 2 | 12 | 7 | 5 | 1 | 4 | 6 | 7 |

| | | | |
|---|---|---|---|
| 2 | Criticize in detail about the functions of Automation in manufacturing | K5 | Evaluate |
| 3 | A transfer line with 34 stations has an ideal cycle time of 0.65 minutes, an average downtime of 8.6 minutes per line stop occurrence, and a station failure frequency of 0.02 for all stations. After analysis, the system designer proposes to locate a storage buffer between stations 27 and 28 to improve line efficiency. Determine, first, the current line efficiency and production rate; and, second, the maximum possible line efficiency and production rate that would result from installing the proposed storage buffer. | K5 | Evaluate |
| 4 | A 30-station transfer line has an ideal cycle time Tc=0.75 min, an average downtime Td = 6.0 min per line stop occurrence, and a station failure frequency p = 0.01 for all stations. A storage buffer is located between stations 15 and 16 to improve the line efficiency. Using the upper bound approach, determine<br>(i) The current line efficiency and production rate.<br>(ii) Maximum possible line efficiency and production rate because of the storage buffer. | K5 | Evaluate |
| 5 | The following data apply to a 12-station in-line transfer machine: P = 0.01 (all stations have an equal probability of failure) Tc = 0.3 min<br>Td = 3.0 min | K6 | Create |

| | | | |
|---|---|---|---|
| | Using the lower-bound approach, Estimate the following for the transfer machine:<br>(i) F, the frequency of line stops. (ii) Rp, the average production rate.<br>(iii) E, the line efficiency.<br>What proportion of work parts are removed from the transfer line? | | |