| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Q.5 | i. | What is FMS? How it overcomes the limitations of conventional manufacturing? Explain it. | **4** | 2 | 4 | 1 | 1 |
| | ii. | What is the transfer device? Explain the automated handling systems. | **6** | 2 | 4 | 1 | 1 |
| OR | iii. | Write the objectives, types and applications of automated storage and retrieval system. | **6** | 2 | 4 | 1 | 1 |
| Q.6 | | Attempt any two: | | | | | |
| | i. | Write the difference between inspection and testing in Automated systems. | **5** | 1 | 5 | 1 | 1 |
| | ii. | Explain with neat sketch the construction and working of Coordinate measuring machine. | **5** | 2 | 5 | 1 | 1 |
| | iii. | Write a short note on 'Contact and Non-Contact Inspection Techniques'. | **5** | 2 | 5 | 1 | 1 |

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*Total No. of Questions: 6* *Total No. of Printed Pages:4*

**Enrollment No.....**

# Faculty of Engineering
## End Sem Examination Dec 2024
## ME3EL04 Manufacturing Automation

Programme: B.Tech. Branch/Specialisation: ME

**Duration: 3 Hrs.** **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

| | | | **Marks** | **BL** | **CO** | **PO** | **PSO** |
|---|---|---|---|---|---|---|---|
| Q.1 | i. | Which one of following is not the correct reason of automation?<br>(a) Demand of high quality product<br>(b) High labour cast<br>(c) To produce more complex shapes<br>(d) Poor infrastructure of workshops | **1** | 1 | 1 | 1 | 1 |
| | ii. | What are the main components of a manufacturing automation system?<br>(a) PLC, HMI and a control system<br>(b) Sensors, actuators and a control system<br>(c) Robots, conveyors and a control system<br>(d) All of these | **1** | 1 | 1 | 1 | 1 |
| | iii. | In which type of production system the unit cost of production is low?<br>(a) Combined production<br>(b) Continuous production<br>(c) Intermittent production<br>(d) Custom production | **1** | 2 | 2 | 1 | 1 |
| | iv. | A system that uses a minimal amount of resources to produce a high volume, high quality goods with some variety is known as-<br>(a) Lean production system<br>(b) Mass production system<br>(c) Continuous production system<br>(d) Repetitive production system | **1** | 2 | 2 | 1 | 1 |

P.T.O.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| v. | Which of the following is not a common input device in a control system?<br>(a) Speakers (b) Actuators<br>(c) Sensors (d) Timers | **1** | 1 | 3 | 1 | 1 |
| vi. | What type of control system uses a set of pre-programmed instructions to control a process?<br>(a) Sequential control<br>(b) Proportional control<br>(c) Integral control<br>(d) Programmable logic control | **1** | 1 | 3 | 1 | 1 |
| vii. | Which is NOT a reported benefit of FMS?<br>(a) Lead time and throughput time reduction<br>(b) Increased quality<br>(c) Increased utilization<br>(d) More flexible than the manufacturing systems they replace | **1** | 1 | 4 | 1 | 1 |
| viii. | AGVs can be used as-<br>(a) Pallets<br>(b) Load & unload stations<br>(c) Work piece transport equipment<br>(d) Workstations | **1** | 1 | 4 | 1 | 1 |
| ix. | Which of the following is not true about automatic inspection machine?<br>(a) Human intervention is required to judge the quality<br>(b) Consists of a logic system<br>(c) Self diagnostic system is present<br>(d) Microprocessors are present | **1** | 1 | 5 | 1 | 1 |
| x. | CMM stands for -<br>(a) Coordinate measuring machines<br>(b) Concrete measuring machines<br>(c) Classical measuring methods<br>(d) Coordinate measuring methods | **1** | 1 | 5 | 1 | 1 |
| Q.2 i. | Define automation. Explain the levels of automation | **2** | 1 | 1 | 1 | 1 |
| ii. | What are the types of automation? Explain it. | **3** | 2 | 1 | 1 | 1 |



| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | iii. | What are the reasons of automation? Also write the advantages and limitations of automation. | **5** | 2 | 1 | 1 | 1 |
| OR | iv. | Write the automation principles and strategies in detail. | **5** | 2 | 1 | | 1 |
| Q.3 | i. | What are the different types of production system in automation? | **3** | 1 | 2 | 1 | 1 |
| | ii. | Three products are to be processed through a certain type of work center. Pertinent data are given in the following table- | **7** | 3 | 2 | 1 | 1 |

| Product (unit/h) | Weekly demand | Production rate (unit/h) |
|---|---|---|
| 1 | 600 | 10 |
| 2 | 1000 | 20 |
| 3 | 2200 | 40 |

Determine the number of work centers required to satisfy this demand, given that the plant works 10 shifts per week and there are 6.5 h available for production on each work center for each shift. Assume suitable data if required.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| OR | iii. | A production machine is operated 65 h/week at full capacity. Its production rate is 20 units/h. During a certain week, the machine produced 1000 good parts and was idle the remaining time.<br>(a) Determine the production capacity of the machine<br>(b) What was the utilization of the machine during the week under consideration? | **7** | 3 | 2 | 1 | 1 |
| Q.4 | | Attempt any two: | | | | | |
| | i. | What is programmable logic controller (PLC)? Explain the components of PLC. | **5** | 2 | 3 | 1 | 1 |
| | ii. | Explain the basic concepts of control system. Also differentiate between open loop and closed loop control system. | **5** | 2 | 3 | 1 | 1 |
| | iii. | What do you understand by the term "Automation in continuous and discrete product industries"? Explain it. | **5** | 2 | 3 | 1 | 1 |

## Marking Scheme
## ME3EL04 (T) Manufacturing Automation (T)

| | | | |
|---|---|---|---|
| Q.1 | i) | (d) Poor infrastructure of workshops | **1** |
| | ii) | (d) All of these | **1** |
| | iii) | (b) Continuous production | **1** |
| | iv) | (a) Lean production system | **1** |
| | v) | (a) Speakers | **1** |
| | vi) | (d) Programmable logic control | **1** |
| | vii) | (d) More flexible than the manufacturing systems they replace | **1** |
| | viii) | (c) Work piece transport equipment | **1** |
| | ix) | (a) Human intervention is required to judge the quality | **1** |
| | x) | (a) Coordinate measuring machines | **1** |
| Q.2 | i. | Definition – 1M<br>levels -1M | **2** |
| | ii. | What are the types of automation? Explain it. 1mark for each *3=3 M | **3** |
| | iii. | reasons -2M<br>advantages -1.5M<br>limitations -1.5M | **5** |
| OR | iv. | principles -2.5M<br>strategies -2.5M | **5** |
| Q.3 | i. | types of production system -2M<br>Diagram-1M | **3** |
| | ii. | Three products are to be processed through a certain type of work center. Pertinent data are given in the following table- | **7** |

| Product (unit/h) | Weekly demand | Production rate (unit/h) |
|---|---|---|
| 1 | 600 | 10 |
| 2 | 1000 | 20 |
| 3 | 2200 | 40 |

Determine the number of work centers required to satisfy this demand, given that the plant works 10 shifts per week and there are 6.5 h available for production on each work center for each shift. Assume suitable data if required.

$$W = \frac{165}{65} = 2.54 \text{ work centers}$$

| | | | |
|---|---|---|---|
| OR | iii. | A production machine is operated 65 h/week at full capacity. Its production rate is 20 units/h. During a certain week, the machine produced 1000 good parts and was idle the remaining time.<br>(a) Determine the production capacity of the machine 3.5 Marks<br>1300 units/week | **7** |

$$U = \frac{1000}{1300} = 0.7692 = 76.92\%$$

(b) What was the utilization of the machine during the week under consideration? 3.5 Marks

$$H = \frac{1000}{20} = 50 \text{ h}$$

| | | | |
|---|---|---|---|
| Q.4 | | Attempt any two: | |
| | i. | Description (PLC) - 2M<br>Components of PLC - 3M | **5** |
| | ii. | basic concepts of control system -2.5M<br>Differentiate between open loop and closed loop control system. -2.5M | **5** |
| | iii. | Automation in continuous -2.5 M<br>Automation in discrete product industries -2.5M | **5** |
| Q.5 | i. | FMS -2M<br>How it overcomes the limitations of conventional manufacturing -2M | **4** |
| | ii. | Transfer device -2M<br>automated handling systems -4M | **6** |
| OR | iii. | Objectives- 2M<br>Types -2M<br>Applications -2M | **6** |
| Q.6 | | Attempt any two: | |

P.T.O.

i. difference between inspection and testing in Automated systems. **5**
1Mark each (1*5=5)

ii. Construction-2.5M **5**
Working -2.5M

iii. Write a short note on ‘Contact and Non-Contact Inspection Techniques’. 2.5 Mark each (2*2.5=5) **5**

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