Register Number:……..

KUMARAGURU
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**M.E / M.TECH DEGREE EXAMINATIONS: NOV/ DEC 2024**

(Regulation 2024)

First Semester

**INDUSTRIAL ENGINEERING**

24ILI503: Industrial Automation

**COURSE OUTCOMES**

**CO1:** Analyze and Describe Automation Systems.

**CO2:** Evaluate Automation in Production Systems for their effectiveness.

**CO3:** Implement and Assess Automated Material Handling Systems.

**CO4:** Design and Integrate Cellular Manufacturing Systems.

**CO5:** Plan and Optimize Flexible Manufacturing Systems.

**Time: Three Hours** **Maximum Marks: 100**

**PART A (4*20 = 80 Marks)**

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| 1. | a) | Explain the architecture of industrial automation systems and discuss how the components of the system (sensors, actuators, controllers, and communication systems) work together to achieve automation. Provide examples to illustrate your answer. | 10 | CO1 | [$K_3$] |
| | b) | What are end effectors in robotics? Discuss the types of end effectors (grippers and tools) and their design considerations. Provide examples of their use in industrial applications. | 10 | CO1 | [K4] |
| 2. | a) | Discuss the components and structure of a production system. Explain the differences between job shop, batch, mass, and continuous production systems with suitable examples. | 10 | CO2 | [K5] |
| | b) | Define computerized manufacturing support systems and discuss their role in production planning and control. Highlight the functions of systems like CAD, CAM, and ERP in the context of manufacturing. | 10 | CO2 | [$K_4$] |
| 3. | a) | Discuss the various types of AGVs, including their features and industrial applications. Explain how vehicle guidance technology (e.g., wire guidance, | 10 | CO3 | [$K_3$] |

laser guidance, and magnetic guidance) is implemented in AGVs.

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| | b) | Explain the working of robotic palletizers. Discuss their types (e.g., in-line and mixed-load palletizers) and benefits in automating pallet handling processes. Include examples of their applications in logistics and manufacturing. | 10 | CO3 | [$K_2$] |
| 4. | a) | Explain the importance of coding and classification in Group Technology (GT). Describe any two popular coding systems used in GT and their application in clustering and part-family formation. | 10 | CO4 | [$K_5$] |
| | B) | Describe the integration of Cellular Manufacturing Systems (CMS) with Industry 4.0. Discuss how advanced technologies such as IoT, digital twins, and AI enhance the efficiency and adaptability of CMS. | 10 | CO4 | [$K_6$] |

**Answer any ONE Question**
**PART B (1*20 = 20 Marks)**

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| 5. | a) | What are the key performance measures used to evaluate Flexible Manufacturing Systems? Discuss measures such as throughput, utilization, and work-in-progress with examples of how they are assessed in an FMS environment. | 10 | CO5 | [$K_5$] |
| | b) | Explain the bottleneck model in the context of FMS. How does the extended bottleneck model improve upon the original model? Discuss their applications in identifying and resolving production bottlenecks. | 10 | CO5 | [$K_5$] |

**OR**

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| 6. | a) | Analyze the recent trend in automated Inventory Management. | 7 | CO5 | [$K_6$] |
| | b) | How do scheduling decision affects the supply chain efficiency? | 6 | CO5 | [$K_4$] |
| | c) | Define flexibility in the context of manufacturing systems. Discuss the different types of flexibility (e.g., machine, routing, process, product) and their significance in Flexible Manufacturing Systems (FMS). Explain common FMS layout configurations with diagrams and examples. | 7 | CO5 | [$K_4$] |

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