Register No : _____

**THE KAVERY ENGINEERING COLLEGE**

***(An Autonomous Institution)***

**M.E DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2025**

***Second Semester***

***Product Design and Development***

**CD4092/PPDE2405 - Industrial Robotics and Expert Systems**

***Regulations – 2021/2024***

***Duration : 3 Hrs*** ***Maximum : 100 Marks***

***PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)***

| *Q.No* | *Questions* | *BLT* | *CO* | *Marks* |
|---|---|---|---|---|
| 1. | What is meant by robot anatomy? | L1 | 1 | 2 |
| 2. | Compare direct and inverse kinematics. | L2 | 1 | 2 |
| 3. | What is the primary function of a position sensor in a robot? | L1 | 2 | 2 |
| 4. | How do air-operated grippers work? | L2 | 2 | 2 |
| 5. | Differentiate between proximity sensors and range sensors. | L2 | 3 | 2 |
| 6. | Define pattern recognition. | L1 | 3 | 2 |
| 7. | List any two safety measures in robotics. | L1 | 4 | 2 |
| 8. | State any four industrial applications of the robots. | L2 | 4 | 2 |
| 9. | What is motion interpolation in robot programming? | L1 | 5 | 2 |
| 10. | What is the role of AI in the robotics? | L2 | 5 | 2 |

***PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)***

| *Q.No* | | | *Questions* | *BLT* | *CO* | *Marks* |
|---|---|---|---|---|---|---|
| 11. | a | | State the different robot configurations. Explain four common robot configurations with suitable sketches. | L2 | 1 | 16 |
| | | | **Or** | | | |
| | b | | Describe briefly the various methods of orientation and location of objects. | L2 | 1 | 16 |
| 12. | a | i | Name the different drives used in the robot operations. Discuss any one drive system used for robot operations with a suitable sketch. | L3 | 2 | 8 |
| | | ii | Discuss the working principle behind magnetic grippers. Compare the design of an electromagnet-based gripper versus a permanent magnet gripper. | L3 | 2 | 8 |
| | | | **Or** | | | |
| | b | | Illustrate with suitable sketch, explain the working principle of stepper motor and describe how they generate discrete angular motion increments. | L3 | 2 | 16 |

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|---|---|---|---|---|---|---|
| 13. | a | | Explain in detail about the different types of sensors used in robots and explain its uses. | L3 | 3 | 16 |
| | | | **Or** | | | |
| | b | | With a block diagram explain the modules involved in robotic vision system. | L3 | 3 | 16 |
| 14. | a | | With suitable sketch, explain the various robot cell layouts. List their merits and limitations. | L4 | 4 | 16 |
| | | | **Or** | | | |
| | b | i | Briefly explain the feature of robots used in the areas of agriculture and under water exploration. | L4 | 4 | 8 |
| | | ii | Explain robot cycle time analysis. | L4 | 4 | 8 |
| 15. | a | | What are the methods involved in robot programming? And also give the detailed comparison of merits and demerits with all aspects. | L5 | 5 | 16 |
| | | | **Or** | | | |
| | b | | Design a knowledge-based expert system (KBES) for a robot, evaluating the steps involved in problem representation, problem reduction, and AI technique selection. | L5 | 5 | 16 |