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Question Paper Code	13987
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B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Fifth Semester

Mechanical Engineering
20MEPC502 - ROBOTICS

Regulations - 2020

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

	Marks	K- Level	CO
1. The physical structure of a robot including links, joints, and actuators is known as its (a) Control system (b) Drive system (c) Anatomy (d) Architecture	1	K1	CO1
2. Robots are commonly used in which of the following applications? (a) Material handling (b) Welding and painting (c) Assembly and inspection (d) All of the above	1	K1	CO1
3. The main disadvantage of hydraulic drives is _____. (a) High accuracy (b) Oil leakage and maintenance (c) Silent operation (d) High energy efficiency	1	K1	CO2
4. Vacuum grippers are most effective for _____. (a) Flat and smooth surfaces such as glass or sheet metal (b) Irregular-shaped castings (c) Heavy metallic parts (d) High-temperature materials handling	1	K1	CO2
5. The LVDT is used to measure _____. (a) Pressure (b) Position or displacement (c) Temperature (d) Force	1	K1	CO3
6. Identification applications of vision systems are mainly used for _____. (a) Recognizing parts or labels (b) Detecting temperature variations (c) Measuring humidity (d) Adjusting brightness	1	K1	CO3
7. The number of degrees of freedom (DOF) of a robot represents _____. (a) Number of sensors (b) Number of independent motions possible (c) Number of actuators only (d) Number of coordinate frames	1	K1	CO4
8. The GRIP command in VAL is used for _____. (a) Controlling end-effector or gripper (b) Adjusting speed (c) Activating sensors (d) Defining workspace	1	K1	CO4
9. RGVs are typically used for _____. (a) Material handling along a fixed track (b) Free floor movement (c) Precision machining (d) Painting applications	1	K1	CO5
10. Which component is essential for a robot to perform autonomous navigation? (a) Display screen (b) GPS or LiDAR sensor (c) Hydraulic pump (d) Cooling system	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11. State any two drawbacks of robotic systems.	2	K1	CO1
12. What is the need for robots in manufacturing industries?	2	K1	CO1
13. Compare hydraulic and pneumatic drive.	2	K2	CO2
14. List two design considerations for selecting a suitable gripper for a robot.	2	K1	CO2
15. Define an optical encoder and state its purpose.	2	K1	CO3
16. Write the purpose of a wrist sensor in a robotic manipulator.	2	K1	CO3
17. Compare inverse and reverse kinematics.	2	K2	CO4
18. Name any two types of lead-through programming techniques.	2	K1	CO4

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

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| 19. List any two types of guidance systems used in AGVs. | 2 | K1 | CO5 |
| 20. Write any two factors considered in the economic analysis of robots. | 2 | K1 | CO5 |
| 21. What is feedback in sensory control systems? | 2 | K1 | CO6 |
| 22. Mention any two control systems used in automated robots. | 2 | K1 | CO6 |

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

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| 23. a) | Explain the different types and classifications of robots based on their configuration, control system, and applications with neat sketches. | 11 | K2 | CO1 |
| OR | | | | |
| b) | Illustrate the key components of a robotic system and explain the role of each in ensuring proper operation. | 11 | K2 | CO1 |
| 24. a) | Illustrate the differences among DC servo motors, AC servo motors, stepper motors in terms of their working method, control accuracy, and applications. | 11 | K2 | CO2 |
| OR | | | | |
| b) | Explain the operation of pneumatic and hydraulic grippers and compare their characteristics. | 11 | K2 | CO2 |
| 25. a) | Illustrate the Structured Lighting Approach employed in range sensing, outlining its operating principle, major components, and key factors influencing its accuracy. | 11 | K2 | CO3 |
| OR | | | | |
| b) | Explain the steps involved in image data reduction, segmentation, and feature extraction in detail. | 11 | K2 | CO3 |
| 26. a) | Derive the forward kinematic equations for a planar 2-DOF robotic manipulator using Denavit-Hartenberg (D-H) parameters. | 11 | K2 | CO4 |
| OR | | | | |
| b) | Write a VAL robot program for a pick-and-place operation, incorporating motion, sensor, and end-effector commands, and outline the function of each instruction in detail. | 11 | K2 | CO4 |
| 27. a) | Summarize the safety considerations and protective measures to be followed during robot operation in industries. | 11 | K2 | CO5 |
| OR | | | | |
| b) | Explain the factors to be considered before implementing robots in an industrial environment and outline the system integration process. | 11 | K2 | CO5 |
| 28. a) | Identify how sensory control enhances the accuracy of additive manufacturing robots application. | 11 | K3 | CO6 |
| OR | | | | |
| b) | Apply the robotic automation concepts to outline a hospital logistics system, explaining how navigation and control coordination are achieved. | 11 | K3 | CO6 |