Question Paper Code	13386

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Eighth Semester

Electronics and Communication Engineering

20ECEL809 - ROBOTICS AND AUTOMATION

Regulations - 2020

Duration: 3 Hours   Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)
Answer ALL Questions

		Marks	K-Level	CO
1.	Which of the following is NOT a major component of a robot?	1	K1	CO1
	(a) Actuators (b) Sensors			
	(c) System Control (d) Database management system			
2.	Which type of robot is commonly used for welding and assembly tasks in industries?	1	K1	CO1
	(a) Humanoid robot (b) Articulated robot			
	(c) Autonomous robot (d) Collaborative robot			
3.	Which of the following motors is best suited for precise angular position control?	1	K1	CO2
	(a) DC Motor (b) Servo Motor (c) Induction Motor (d) Universal Motor			
4.	In robotic navigation, which type of sensor is primarily used to determine the orientation and heading of the robot?	1	K1	CO2
	(a) Gyroscope (b) Ultrasonic Sensor (c) Load Cell (d) pH Sensor			
5.	In a 2R robotic manipulator, how many degrees of freedom (DOF) does the system have?	1	K1	CO3
	(a) 1 (b) 2 (c) 3 (d) 4			
6.	What is the primary advantage of using the Lagrangian formulation in robot dynamics?	1	K1	CO3
	(a) It simplifies force calculations by using energy-based equations			
	(b) It directly provides control algorithms for motors			
	(c) It ignores gravity effects on the system			
	(d) It only applies to one-degree-of-freedom systems			
7.	What is the primary objective of SLAM in robotics?	1	K1	CO4
	(a) To move a robot randomly without a predefined path			
	(b) To simultaneously build a map of an environment while tracking the robot's location			
	(c) To control the speed of motors in a robot			
	(d) To detect colors in the surroundings			
8.	Which of the following algorithms is commonly used for path planning in serial manipulators?	1	K1	CO4
	(a) A*Algorithm (b) Dijkstra's Algorithm			
	(c) Rapidly-Exploring Random Tree (RRT) (d) All of the above			
9.	Which machine learning technique is commonly used for training AI systems to recognize patterns and make decisions?	1	K1	CO5
	(a) Reinforcement Learning (b) Newtonian Mechanics			
	(c) Boolean Algebra (d) Fluid Dynamics			
10.	What is a primary application of micro and nanorobots in medicine?	1	K1	CO6
	(a) Large-scale construction (b) Drug delivery at a cellular level			
	(c) Industrial welding (d) Traffic control			

PART - B (12 × 2 = 24 Marks)
Answer ALL Questions

		Marks	K-Level	CO
11.	Differentiate between robotics and automation.	2	K2	CO1
12.	How are robots classified based on their kinematic structure?	2	K1	CO1

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **13386**

13. Why are servo motors preferred in robotic arms overDC motors?	2	K2	CO2
14. List any four important factors to be considered in the selection and design of grippers.	2	K1	CO2
15. How do optical sensors detect changes in the environment, and what are two common types used in robotics?	2	K2	CO3
16. Distinguish serial and parallel manipulator.	2	K2	CO3
17. Define forward kinematics and inverse kinematics.	2	K1	CO4
18. Define free vector.	2	K1	CO4
19. What is the primary challenge addressed by SLAM in robotic navigation?	2	K1	CO5
20. How do neural networks improve robotic decision-making and control?	2	K2	CO5
21. Name the application areas of artificial intelligence.	2	K1	CO6
22. What is the primary goal of humanoid robots, and name one famous humanoid?	2	K2	CO6

PART - C (6 × 11 = 66 Marks)
Answer ALL Questions

23. a) Analyze the four basic robot configurations that are suitable for making industrial robots with neat sketch.	11	K2	CO1
OR			
b) (i) List out any four control requirements that must be managed by controller to achieve real time computer process control and analyze them in brief.	6	K2	CO1
(ii) Analyze the requirements of DOFs for any industrial manipulator in material handling.	5	K2	CO1
24. a) Explain in detail the different types of electric motors DC motor, servo motor and stepper motor along with its specifications.	11	K2	CO2
OR			
b) Explain in detail the working of a nontraditional actuators and bring out its significance when compared with conventional electric, hydraulic and Pneumatic actuators.	11	K2	CO2
25. a) Analyze about the sensors and actuators in maze solving robot system.	11	K2	CO3
OR			
b) Enumerate the design and selection of various grippers in robotics.	11	K2	CO3
26. a) Obtain the Geometric approach for 3 R manipulator in detail with necessary diagram and equations for both the forward Kinematics and Inverse Kinematics.	11	K2	CO4
OR			
b) Analyze the kinematic motion to describe the end of the link in world space using homogeneous transformation by applying D-H convention and derive the kinetic equation.	11	K2	CO4
27. a) (i) Examine the force control of robotic manipulator.	6	K2	CO5
(ii) Examine the Pneumatic manipulator control circuits.	5	K2	CO5
OR			
b) Discuss in detail about the Neural Network Force Control for Industrial Robots.	11	K2	CO5
28. a) Explain the design challenges and importance of micro and nano robots.	11	K2	CO6
OR			
b) Explain the development and functions of unmanned vehicles.	11	K1	CO6

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