Reg. No.															

Question Paper Code	13299

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Eight Semester

Electronics and Communication Engineering

20ECEL809 - ROBOTICS AND AUTOMATION

Regulations - 2020

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which category of robotics mentioned below are often used for welding, assembly, and packaging? (a) Industrial (b) Agricultural (c) Social (d) Service	1	K1	CO1
2.	What is the primary goal of automation in manufacturing? (a) Increase manual labor (b) Reduce human intervention (c) Enhance job complexity (d) Encourage manual errors	1	K1	CO1
3.	Space exploration relies on robots for tasks requiring extreme _____. (a) Intelligence (b) Agility (c) Precision (d) Social skills	1	K1	CO1
4.	From the following which is the simplest direction control valve? (a) Check valve (b) Shuttle valve (c) Two way direction control (d) Four way direction control valve	1	K1	CO2
5.	Thermistors have _____ (a) Positive temperature coefficient (b) Negative temperature coefficient (c) Zero temperature coefficient (d) Infinite temperature coefficient	1	K1	CO2
6.	Two stator windings of ac servomotors are oriented _____ electrical degrees apart (a) 90 (b) 60 (c) 120 (d) 180	1	K1	CO2
7.	Change in resistance is measured using a _____ (a) Anderson's bridge (b) Wheatstone's bridge (c) Hay's bridge (d) Maxwell's bridge	1	K1	CO3
8.	Which sensor is linear and low accuracy? (a) Thermistor (b) Resistance Thermometer (c) Thermo couple (d) Semiconductor based sensor	1	K1	CO3
9.	_____ sensor is used by touch screen devices. (a) Pressure sensor (b) Temperature sensor (c) Humidity sensor (d) Touch sensor	1	K1	CO3
10.	Task performed by a _____ are in the Joint space. (a) Manipulator (b) Grippers (c) Actuator (d) Cylinders	1	K1	CO4
11.	The parameter needed to define the relative location of the two axes is _____. (a) link twist (b) link length (c) both the link twist and the link length (d) Link width	1	K1	CO4
12.	The position of a robot in world coordinates is often given by _____ (a) Homogeneous coordinates (b) Polar coordinates (c) Cylindrical coordinates (d) Joint coordinates	1	K1	CO4
13.	How does Force Control contribute to compliance in robotic systems? (a) By limiting joint flexibility (b) By increasing joint torques (c) By regulating end-effector forces during contact (d) By ignoring external force	1	K1	CO5
14.	"SLAM" stand for (a) Sensory Leveling and Analysis Mechanism (b) Simultaneous Localization and Mapping (c) Spatial Learning and Automated Mapping (d) Systematic Location Assessment Module	1	K1	CO5

15. What is the purpose of a 3D accelerometer in robotics? *1 K1 CO5*
    (a) Speed measurement (b) Distance sensing
    (c) Angular velocity measurement (d) Gravity detection
16. What is the primary goal of path planning for serial manipulators in robotics? *1 K1 CO5*
    (a) Minimizing power consumption
    (b) Maximizing speed
    (c) Determining the optimal trajectory for end-effector movement
    (d) Avoiding collisions
17. How do cognitive robots primarily learn new tasks? *1 K1 CO6*
    (a) By following a strict set of pre-programmed instructions
    (b) Through manual programming for each new task
    (c) By mimicking human behavior observed through sensors
    (d) Through experience and interaction with their environment
18. In Virtual Reality systems, what role does 'tracking' play? *1 K1 CO6*
    (a) It prevents the user from physically moving in the space.
    (b) It tracks the user's progress in a game and only saves it once completed.
    (c) It monitors the user's position and orientation to adjust the virtual environment accordingly.
    (d) It is used to track and report illegal users to authorities.
19. How are micro and nano robots expected to impact the future of non-invasive surgery? *1 K1 CO6*
    (a) By replacing all human surgeons with robot surgeons
    (b) Making surgeries entirely unnecessary through preventive measures
    (c) Performing precise operations inside the body without the need for large incisions
    (d) Focusing solely on cosmetic surgeries
20. In tele-robotics, 'latency' refers to: *1 K1 CO6*
    (a) The battery life of the robot
    (b) The delay between a user's command and the robot's response
    (c) The robot's learning curve over time
    (d) The weight of the tele-robotic system

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21. What is meant by Work space? *2 K1 CO1*
22. State Asimov’s laws of robotics. *2 K1 CO1*
23. List any two advantages of pneumatic drive system. *2 K1 CO2*
24. Compare DC motor and servo motor. *2 K2 CO2*
25. Define resolution. *2 K1 CO3*
26. What are the applications of machine vision system? *2 K1 CO3*
27. What is reverse kinematics? *2 K1 CO4*
28. What is link? *2 K1 CO4*
29. Define a complete plan. *2 K1 CO5*
30. What are Cognitive robots? *2 K1 CO6*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31. a) Describe the types of joints used in robots. *10 K2 CO1*

OR

    b) Describe the evolution of Robots. *10 K2 CO1*

32. a) Explain the construction and working principle of pneumatic actuator. *10 K2 CO2*

OR

    b) Illustrate the working of stepper motor. *10 K2 CO2*

33.	a)	Explain the working principle of any four types of sensors with neat sketch.	*10*	*K2*	*CO3*
		OR			
	b)	Describe the working principle of Proximity sensors with neat sketch.	*10*	*K2*	*CO3*
34.	a)	Derive the D- H Transformation for a general purpose joint link combination.	*10*	*K2*	*CO4*
		OR			
	b)	A point $p(7,3,1)^T$ is attached to a frame F_{noa} and is subjected to the following transformations. Find the coordinates of the point relative to the reference frame at the conclusion of all the below transformations. 1. Rotation of 90^o about the z-axis 2. Followed by a translation of [4,-3,7] 3. Followed by a rotation of 90^o about the y-axis	*10*	*K2*	*CO4*
35.	a)	Illustrate the hill climbing techniques of robots.	*10*	*K2*	*CO5*
		OR			
	b)	In a particular application, a robot is used to sort diamonds by weight and by color and determine a price for the diamonds. Design a fuzzy logic system to control the process.	*10*	*K2*	*CO5*
36.	a)	Explain in detail about Micro and Nano robots.	*10*	*K2*	*CO6*
		OR			
	b)	Explain the applications of Machine Learning.	*10*	*K2*	*CO6*