Reg. No.															

Question Paper Code	13581

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 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.	_____ is a machine that has functions similar to human upper limbs, and moves the objects spatially. (a) Manipulator (b) Playback Robot (c) Intelligent Robot (d) Smart Device	1	K1	CO1
2.	Who coined the word "Robotics"? (a) Karel Capek (b) Issac Asimov (c) Isaac Newton (d) Elon Musk	1	K1	CO1
3.	Pneumatic drives in robots are primarily used for: (a) High-precision control of position (b) Heavy lifting and high-torque applications (c) Creating rapid, repetitive motions with lower precision (d) Controlling rotational movement with high accuracy	1	K1	CO2
4.	Identify the motor type well known for providing precise control of angular position and can be used for both rotary and linear motion in robotics. (a) Servo Motor (b) Stepper Motor (c) Pneumatic Drive (d) Hydraulic Drive	1	K1	CO2
5.	Select the device used for force measurement. (a) Beams (b) Bellows (c) Capsule (d) Bourdon tube	1	K1	CO3
6.	Which of the following conversion is correct for load cell? (a) Force to strain (b) Force to displacement (c) Force to voltage (d) Both force to strain and force to displacement	1	K1	CO3
7.	In inverse kinematics, which of the following is typically sought? (a) End-effector velocity (b) Joint angles from a desired end-effector position (c) Robot torque requirements (d) Path optimization	1	K1	CO4
8.	Which transformation is often used in forward kinematics to represent the position of a joint? (a) Rotation matrices (b) Homogeneous transformation matrices (c) Affine transformation (d) Cartesian coordinates	1	K1	CO4
9.	What type of robot is specifically designed to work alongside humans? (a) Industrial robot (b) Mobile robot (c) Collaborative robot (Cobot) (d) Service robot	1	K1	CO5
10.	Which sensor uses structured lighting to enhance depth perception? (a) Ultrasonic sensor (b) Infrared sensor (c) Laser scanner (d) Touch sensor	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	Define the pitch, yaw and roll motion of the robot.	2	K1	CO1
12.	Define work volume of a robot.	2	K1	CO1
13.	List the various types of gripper.	2	K1	CO2
14.	Classify different types of stepper motor.	2	K2	CO2
15.	Differentiate between transducer and sensor.	2	K2	CO3
16.	Discuss on windowing.	2	K2	CO3

17.	Differentiate between Forward kinematics and reverse kinematics.	2	K2	CO4
18.	Write the Forward kinematic equation for 2DOF of a Robot in 2Dimensions.	2	K3	CO4
19.	What is AGV? Where it is Used?	2	K2	CO5
20.	What is a Pallet?	2	K1	CO5
21.	Differentiate between binary sensors and analog sensors in terms of output.	2	K2	CO6
22.	What is the purpose of a slip sensor in mobile robotics?	2	K1	CO6

PART - C (6 × 11 = 61 Marks)

Answer ALL Questions

23.	a)	Sketch and Explain the joint notation scheme.	11	K3	CO1
		OR			
	b)	Sketch and Explain the different types of Robot Coordinate Systems.	11	K3	CO1
24.	a)	Explain with neat sketch about following:			
	(i)	Types of servo motors.	6	K2	CO2
	(ii)	Components of pneumatic actuation system.	5	K2	CO2
		OR			
	b) (i)	Describe the different types of Mechanical grippers.	6	K2	CO2
	(ii)	Write note on Gripper selection and design.	5	K2	CO2
25.	a)	Explain the working principle of Proximity sensors with neat sketch.	11	K2	CO3
		OR			
	b)	With neat sketch explain the following			
	(i)	Resolvers.	6	K2	CO3
	(ii)	Optical Encoders.	5	K2	CO3
26.	a)	Derive the forward and reverse transformation of 2-Degree of freedom in two dimensions and 3-degree of freedom arm.	11	K2	CO4
		OR			
	b) (i)	Explain the teach pendant for Robot system.	6	K2	CO4
	(ii)	Explain Lead through method.	5	K2	CO4
27.	a)	Briefly explain AGV and RGV types of robots in detail.	11	K2	CO5
		OR			
	b)	How economic analysis is done in Payback method? Explain with examples.	11	K2	CO5
28.	a)	Explain the usage of End effectors commands in Robotics and solve a program for palletizing the parts.	11	K2	CO6
		OR			
	b)	Prepare the factors to be considered for selection of sensors and write down the classifications of sensors.	11	K2	CO6