

Code No: R203103B

R20

III B. Tech II Semester Regular/Supplementary Examinations, April -2025
INDUSTRIAL ROBOTICS
(MECHANICAL ENGINEERING)

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**

All Questions Carry Equal Marks

		<u>UNIT-I</u>	
1.	a)	Explain the classification of robots based on coordinate systems and control systems with suitable examples.	[7M]
	b)	Discuss the present and future applications of robots in various industries.	[7M]
		(OR)	
2.	a)	Describe in detail about the anatomy of an industrial robot and explain how work volume is determined.	[7M]
	b)	Draw and explain a function line diagram representation of a robot arm. List common types of robot arms.	[7M]
		<u>UNIT-II</u>	
3.	a)	Explain the homogeneous transformation matrices and apply them to solve a basic rotation and translation problems.	[7M]
	b)	Describe the Denavit-Hartenberg (D-H) representation of a manipulator and explain its significance.	[7M]
		(OR)	
4.	a)	What are inverse kinematics problems? Explain the methods used to solve inverse kinematics with examples.	[7M]
	b)	Discuss the role of kinematics in robot motion planning with reference to coordinate transformations.	[7M]
		<u>UNIT-III</u>	
5.	a)	Solve a problem involving Jacobian for a two-link planar manipulator.	[7M]
	b)	Discuss the Lagrange-Euler formulation for robot arm dynamics. Derive the equation of motion for a simple manipulator.	[7M]
		(OR)	
6.	a)	What is D'Alembert's principle? How is it applied to robotic motion analysis?	[7M]
	b)	Derive the equations of motion for a robotic arm using the Newton-Euler formulation.	[7M]
		<u>UNIT-IV</u>	
7.	a)	Explain the various trajectory planning methods in robotics with emphasis on obstacle avoidance.	[7M]
	b)	Describe the general considerations in robotic path planning and its importance in industrial applications.	[7M]
		(OR)	

8.	a)	Explain the process of path generation in robotics using programming languages. Provide an example.	[7M]
	b)	Discuss the types of robot programming languages and their applications in trajectory planning.	[7M]
		<u>UNIT-V</u>	
9.	a)	Explain the working principles of feedback components such as potentiometers, encoders, and resolvers.	[7M]
	b)	Discuss the role of velocity sensors in robot motion control. How do they integrate with actuators?	[7M]
		(OR)	
10.	a)	Explain how robots are used in welding and spray painting operations. Include technical aspects like motion and control.	[7M]
	b)	Discuss the use of robots in assembly and inspection operations with examples in modern manufacturing setups.	[7M]

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