B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Seventh Semester

Electronics and Instrumentation Engineering

(Common to Instrumentation and Control Engineering)

20EIPC701 - 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.	A simple mechanical arm is an example of which generation of robots? (a) First Generation (b) Second Generation (c) Third Generation (d) Fourth Generation	1	K1	CO1
2.	Which of the following is a technical feature to be considered in robot design? (a) Colour (b) Degree of freedom (c) Brand name (d) Manufacturing country	1	K1	CO1
3.	What is a key use of sensors in robotics? (a) Programming software (b) Detecting environment and feedback (c) Printing documents (d) Painting parts	1	K1	CO2
4.	Drives are also known as (a)Actuators (b)Manipulator (c) sensor (d) controller	1	K1	CO2
5.	Newton - Euler formulation is used to analyze the ------ behaviour of the manipulator. (a) Static (b) kinematic (c) dynamic (d) kinetic	1	K1	CO3
6.	Industrial robot is generally designed to carry out which coordinate system: (a) Polar (b) Cartesian (c) Cylindrical (d) Spherical	1	K1	CO3
7.	In robotics, Inverse kinematics is used for (a) Finding orientation of tool with respective base (b) Mapping from the tool configuration space back to joint space (c) Finding tool configuration space (d) Mapping from joint space to the tool configuration space	1	K1	CO4
8.	The number of movable joints in the base, arm and end effector determines: Flexibility (b) Payload (c) Operational limit (d) Degrees of freedom	1	K1	CO4
9.	If the orientation changes without the change of position then the transformation is (a) Pure translation (b) Pure rotation (c) Combined transformation (d) None	1	K1	CO5
10.	Following is the robotic like device. (a) Telecherics (b) Exo-skeleton (c) Locomotive device (d) All the above	1	K1	CO5

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

		Marks	K–Level	CO
11.	Describe the payload capacity of a robot.	2	K2	CO1
12.	Discuss about LL and RR robot.	2	K2	CO1
13.	Explain about touch sensor.	2	K2	CO2
14.	Mention the types of robot drives.	2	K1	CO2
15.	Discuss about segmentation.	2	K2	CO3
16.	List the advantages and features of suction cup gripper?	2	K1	CO3
17.	Summarize the functions of machine vision system.	2	K2	CO4
18.	Describe what is meant by a kinematic model of a robot.	2	K2	CO4
19.	Write the Denavit-Hartenberg matrix.	2	K1	CO4
20.	Explain the various methods of robot programming.	2	K2	CO5

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **13850**

21.	Explain the difference between forward and inverse kinematics in robotics.	*2*	*K2*	*CO5*
22.	List four non manufacturing application of robot.	*2*	*K1*	*CO5*

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

23.	a)	Illustrate with diagrams any two robot configurations with the features, advantages and limitations.	*11*	*K2*	*CO1*
		OR			
	b)	What are the basic components of a robotic system? Explain the functions of each of the components with a neat sketch.	*11*	*K2*	*CO1*
24.	a)	Explain the working of Tactile sensor with neat sketch and also list the various characteristics of Sensors.	*11*	*K2*	*CO2*
		OR			
	b)	Explain in detail about Machine vision system in robot with neat diagram.	*11*	*K2*	*CO2*
25.	a)	Classify the different types of Magnetic gripper with neat sketch along with its advantages and disadvantages.	*11*	*K2*	*CO3*
	b)	Explain in detail about manipulators of robot with neat sketch.	*11*	*K2*	*CO3*
26.	a)	Justify how a teach pendant is used for programming and controlling a robot system.	*11*	*K3*	*CO4*
		OR			
	b)	Frame {2} is rotated with respect to frame {1} about x-axis by an angle of 60°. The position of the origin of frame {2} as seen from frame {1} is D2 = [7 5 7]T . The transformation matrix T2 is	*11*	*K3*	*CO4*

$$\begin{vmatrix} 1 & 0 & 0 \\ 0 & 0.5 & -0.866 \\ 0 & 0.866 & 0.5 \end{vmatrix}$$

using this matrix, determine the description of frame {1} relative to frame {2}.

27.	a)	Explain why palletizing is an important process in packaging using neat diagrams.	*11*	*K2*	*CO5*
		OR			
	b)	Illustrate the working principles and applications of Automated Guided Vehicle suitable examples.	*11*	*K2*	*CO5*
28.	a) (i)	Identify why robot motion analysis must be carried out for a robot arm with respect to a reference coordinate system.	*6*	*K3*	*CO4*
	(ii)	Illustrate any two different types of robot cell layouts with suitable examples.	*5*	*K2*	*CO5*
		OR			
	b) (i)	Develop the functions of robot software by identifying its elements.	*6*	*K3*	*CO4*
	(ii)	Explain how different selection criteria are applied to choose a suitable robot for a particular industrial task.	*5*	*K2*	*CO5*