



P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Eight Semester, B.E. - Mechanical Engineering

Semester End Examination; July / August - 2022

Industrial Robotics

Time: 3 hrs

Max. Marks: 100

Course Outcomes

The Students will be able to:

CO1: Classify the robots based on geometrical configuration. Define work volume, resolution and accuracy of various configuration of robot.

CO2: Identify different types of drive system and sensor required for specific applications.

CO3: Explain the forward Kinematics of robots using DH method.

CO4: Develop robot task program using robot language.

CO5: Distinguish the requirements of robot systems for various industrial applications.

Note: I) PART - A is compulsory. Two marks for each question.

II) PART - B: Answer any Two sub questions (from a, b, c) for Maximum of 18 marks from each unit.

Q. No.	Questions	Marks	BLs	COs	POs
I : PART - A		10			
I a.	Define accuracy and repeatability.	2	L1	CO1	PO1
b.	What are internal state sensors?	2	L1	CO2	PO1
c.	What do you mean by direct kinematics problem in robotics?	2	L1	CO3	PO1
d.	What is the function of REACT statement in VAL?	2	L1	CO4	PO1
e.	Write any two robot features generally contributed to the success of the mission to load/unload application.	2	L1	CO5	PO1
II : PART - B		90			
UNIT - I		18			
1 a.	Define industrial robots. According to RIA. With a neat sketch, explain three degree of freedom associated with the robot wrist.	9	L2	CO1	PO1
b.	Sketch and explain polar and jointed arm configuration of a robot with their merits.	9	L2	CO1	PO1
c.	A robot with rotating base is located at a point O and have to transfer an object from a point X to Y where $OX = OY = XY = 1$ m. The base driver is a DC motor which rotates at 540 RPM and connected to the base of the shaft through a reduced gear 3:1. An incremental encoder which emits 500 pulses per second is attached to the motor shaft. Find the resolution and travelling time to move X to Y.	9	L2	CO1	PO1
UNIT - II		18			
2 a.	Write neat sketch, explain the working of incremental and absolute encoders.	9	L2	CO2	PO1
b.	What are range sensors? With a neat sketch explain the working principle of proximity sensors.	9	L2	CO2	PO1
c.	Discuss about the different types of robot drive systems.	9	L2	CO2	PO1

UNIT - III

18

- 3 a. Obtain 2D homogeneous displacement Matrix for an industrial manipulator having two planar links. 9 L2 CO3 2
- b. Describe the geometry based direct Kinematic analysis of 2 degrees of freedom articulated planar mechanism. 9 L2 CO3 2
- c. With neat sketch explain the steps involved in the implementation of DH convection. 9 L2 CO3 PO1

UNIT - IV

18

- 4 a. Explain three basic modes of operation in a robot language operating system. 9 L2 CO4 PO1
- b. Write a robot program for pick and place operation for the press work as indicated in

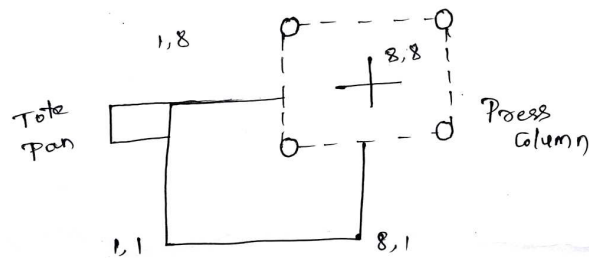


Fig.Q (4b).

9 L2 CO4 PO1

- c. Explain two ways of accomplishing lead through programming. 9 L2 CO4 PO1

UNIT - V

18

- 5 a. With an example, illustrate the application of robot in palletizing and related operations. 9 L2 CO5 PO1
- b. Describe bipod Robot locomotion. 9 L2 CO5 PO1
- c. Discuss about the general considerations in Robot material handling. 9 L2 CO5 PO1

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