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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.*

<u>*Note:*</u> *I)* **PART - A** *is compulsory.* **Two** *marks for each question.*

    II) **PART - B**: *Answer any* <u>**Two**</u> *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

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	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	9	L2	CO4	PO1
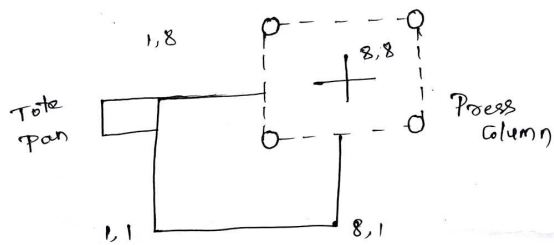
Fig.Q (4b).

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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