

Reg. No.:

Name :



VIT

Vellore Institute of Technology

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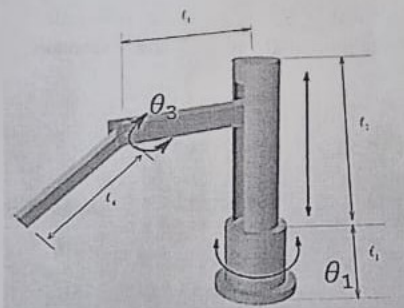
Continuous Assessment Test II – April 2024

Programme	: B.Tech (ECE/ECM)	Semester	: WS 2023-24
Course	: Robotics and Automation	Code	: BECE312L TH
		Class Nbr	: CH2023240502752 CH2023240502750
Faculty	: Anita Christaline. J, Arthi. M.	Slot	: F2+TF2
Time	: 90 Minutes	Max. Marks	: 50

Answer ALL the questionsQ. No. Sub.
Sec.

Questions

Marks



1.

20

- Assume the given 3-DOF robot does pick and place operations.
- Identify and explain the types of joints in this robot. (3 marks)
- Apply Denavit-Hartenberg convention to determine the frames and calculate the D-H parameters. (10 marks)
 - Evaluate the D-H parameters and determine the forward kinematics. (7 marks)

Consider an industrial manufacturing plant where robotic arms are employed for assembly tasks. One of the tasks involves picking up engine components from a conveyor belt, positioning them accurately, and placing them onto a chassis assembly. The robotic arm needs to account for the

2.

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varying weights of components, the speed of the conveyor belt, and the precise positioning required for assembly.

Discuss how you would apply the concepts of kinematics to design the robotic arm for this task.

A single-link robot with a rotary joint is motionless at $\Theta=30$ degrees. It is desired to move the joint in a smooth manner to $\Theta=80$ degrees in 3 seconds.

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| 3. | a) | Find the coefficients of a cubic that accomplishes this motion and brings the manipulator to rest at the goal. (7 marks) | 10 |
| | b) | Plot the displacement and velocity of the joint as a function of time. (3 mark) | |

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| 4. | | It is desired to have the first joint of a 6-axis robot moving from initial angle of 30 degree to a final angle of 75 degree in 5 seconds. Assume the initial acceleration and final deceleration will be 5 degree/sec ² . Using the fifth-order polynomial, determine the joint angle at 1,2,3 and 4 seconds respectively. | 10 |
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Course Faculty
Anita Christaline. J. Arthi. M.

