Reg. No.:

Name :

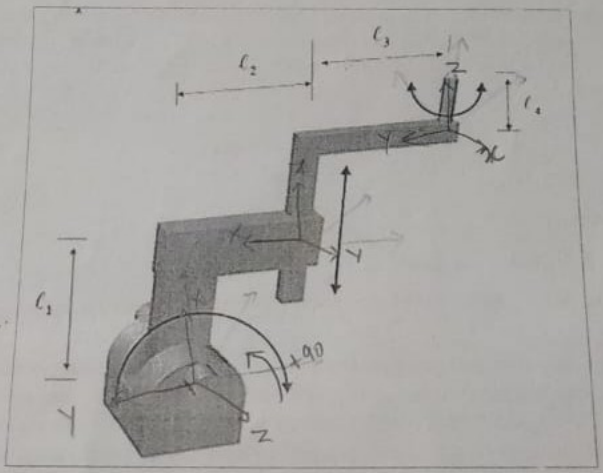
VIT

Vellore Institute of Technology

Continuous Assessment Test II – April 2024

Programme	: B.Tech (ECE/ECM)	Semester	: WS 2023-24
Course	: Robotics and Automation	Code	: BECE312L | TH
		Class Nbr	: CH20232405027S1, CH20232405027S9
Faculty	: Velmathi G, Anita Christaline. J.	Slot	: F1+TF1
Time	: 90 Minutes	Max. Marks	: 50

Answer ALL the questions

Q.No.	Sub. Sec.	Questions	Marks
1.		How can the understanding of rotational, translational, and transformational motions in manipulators be applied for the movement and the performance of robotic arms in complex task such as surgical procedures.	10
2.			20

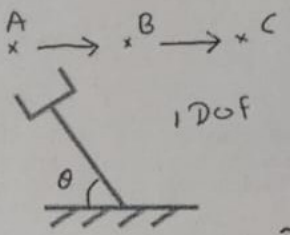
a) For the given 3-DOF robot shown above
Identify and draw appropriate frames for the Denavit-Hartenberg representation. (4 marks)

DOF + 1 ↳ end effector fra

b) Identify and explain the types of joints, links and fill out the D-H parameter table. (6 marks)

Link$_i$	θ_i	d_i	a_i	α_i

c) Derive the forward kinematic equation of the robot from the transformation matrix obtained using the D-H parameters. (10 marks)



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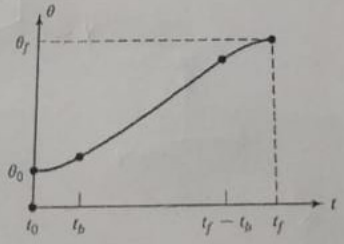
The given robotic arm with 1 DOF moves from position A to B in 2 seconds and then from B to position C in 3 seconds. The initial angle is **5°**, the final angle is **25°** and the intermediate angle is **12°**. Assuming the initial and final velocities are Zero. Derive the trajectory expressions using cubic polynomial.



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For the given robot arm position from t_o to t_f, use parabolic blends method to derive the trajectory expressions. The initial angle is 18° and the final angle is 80°. Assume the blend times at both the sections are equal and velocity at the end of the blend is equal to velocity at linear section. The initial velocity and final velocities are zeros and the duration of the motion is 4 seconds.