VIT
Vellore Institute of Technology
CHENNAI

Reg. Number:

Continuous Assessment Test (CAT) – II - October 2024

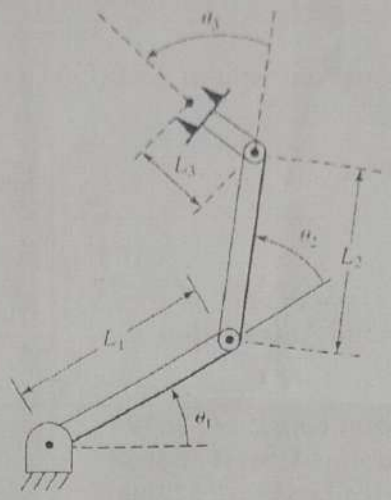
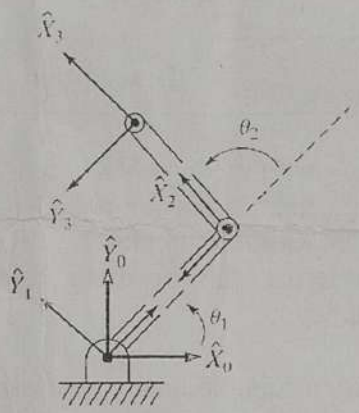
Programme	:	**B.Tech ECE**	Semester	:	**Fall Sem. 2024-25**
Course Code & Course Title	:	**BECE312L & Robotics and Automation**	Class Number	:	**CH2024250101229 CH2024250102746 CH2024250101221 CH2024250101225 CH2024250101219**
Faculty	:	**Dr. Santoshi Ganala / 51679 Dr. Mohammed Aarif / 53684 Dr. R. Priyadarshini / 52200 Dr. S. Abinaya / 52232 Dr. Suguna M / 52215**	Slot	:	**B1 + TB1**
Duration	:	**1½ Hours**	Max. Mark		**50**

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information.
- Only non-programmable calculator without storage is permitted

Answer all questions

Q. No	Sub Sec.	Description	Marks
1.		A company working with medical MRI scans needs to compress the images for efficient storage & transmission and also segment the images to detect abnormalities, such as tumours, using thresholding and region-growing techniques. Considering the need to balance storage efficiency and segmentation accuracy: a) Identify a suitable image compression techniques for the above scenario with five valid reasons. [5 marks] b) Discuss how the compression artifacts might impact segmentation results with a suitable example. [5 marks]	10
2.		Consider the problem of moving a robot from its initial position to a goal position in a certain amount of time. Inverse kinematics allows the set of joint angles that correspond to the goal position and orientation to be calculated. a) Illustrate how a cubic polynomial is used in trajectory generation for a robotic joint moving from an initial position to a final position. [5 Marks] b) Derive the general form of the cubic polynomial for a smooth trajectory, ensuring zero initial and final velocities. [5 Marks]	10

3		 a) For the above given three-link planar arm identify the link parameters and draw DH (Denavit–Hartenberg) table. [7 marks] b) Calculate θ_1, θ_2 and θ_3 using inverse kinematics for the above given three link planar arm. End effector is positioned at X_e, Y_e. [8 marks]	15
4		 A two-link manipulator with rotational joints is shown above. Calculate the velocity of the tip of the arm as a function of joint rates. Give the answer in two forms—in terms of frame {3}, and also in terms of frame {0}.	15

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