

**VIT**

Vellore Institute of Technology

School of Electronics Engineering
Fall Semester 2024-25
Continuous Assessment Test – I

Programme Name & Branch: B.Tech (School of Electronics Engineering)

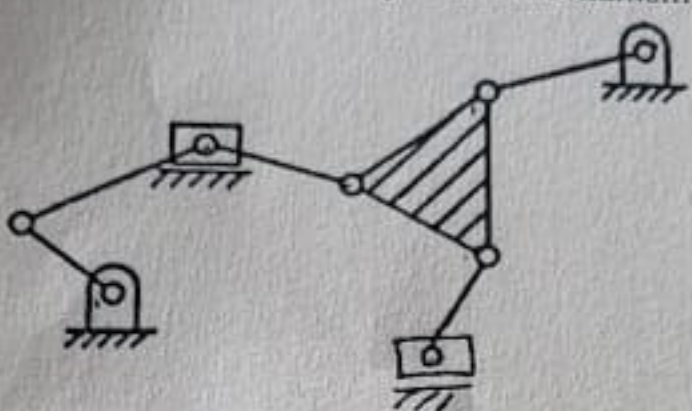
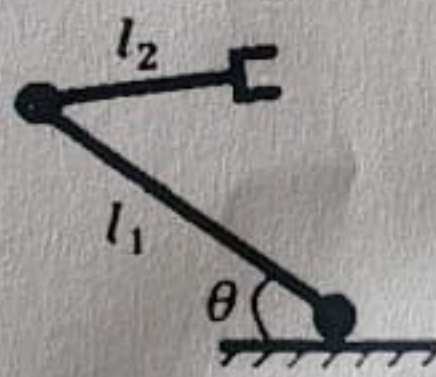
Course Name & Code: ROBOTICS AND AUTOMATION (BECE312L)

Class ID: VL2024250104209/4133/4129

Exam Duration: 90 Min.

SLOT: A2+TA2

Maximum Marks: 50

Q. No.	Questions	Max Marks
1.	a) Classify the different types of joints used in robotic systems. b) Find the DOF and comment on the mobility of the mechanism shown in Figure 1.	3+7
		
	Figure 1	
2.	a) Enlist the performance characteristics of an Industrial robot. b) Figure 2 illustrates 2R planner manipulator with two revolute joints and two links. If $0^\circ \leq \theta \leq 120^\circ$, $l_1 = 6$, $l_2 = 3$ draw the shape of the workspace in xy-plane.	3+7
		
	Figure 2	
3.	Suppose an industrial robot requires smaller steps, high starting torque with high speed - justify on the selection of electrical actuator for the purpose and discuss in detail with suitable diagram. Also, comment on its benefits and drawbacks over other electrical actuators.	10
4.	A pump supplies oil at $0.0016 \text{ m}^3/\text{s}$ with 12 MPa pressure to an 80 mm diameter double-acting hydraulic cylinder and 40 mm rod diameter, find the (i) Hydraulic force during the extending stroke. (ii) Piston velocity during the extending stroke. (iii) Piston velocity during the retracting stroke. (iv) Hydraulic force during the retracting stroke. (v) Cylinder kW power during the both extending and return strokes.	10
5.	Describe a sensor that increases oscillations in the presence of non-metallic objects. Provide its working principle and construction details, along with a neat diagram.	10

