



VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

REG.NO.:

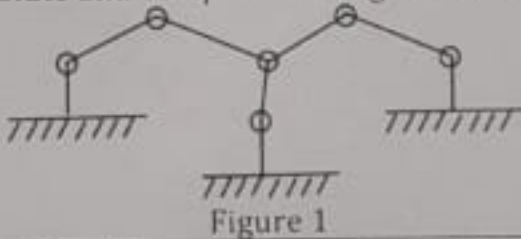
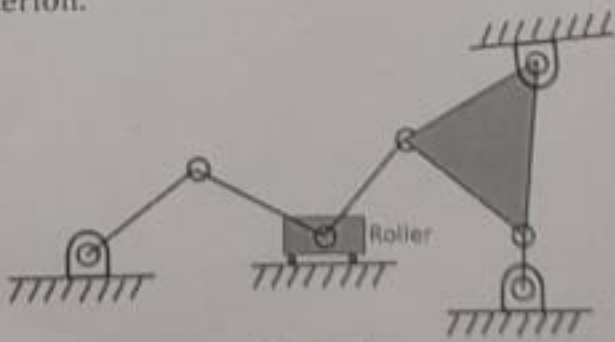
SCHOOL OF ELECTRONICS ENGINEERING
CONTINUOUS ASSESSMENT TEST - I
FALL SEMESTER 2025-2026

SLOT: A1

Programme Name & Branch : BTECH, ECE
Course Code and Course Name : BECE312L, Robotics and Automation
Faculty Name(s) : Dr. Suraj Prakash Sahoo, Dr. Budhaditya Bhattacharyya,
Dr. Kathirvelan J
Class Number(s) : VL2025260103465/3467/ 3468
Date of Examination : 17.08.2025
Exam Duration : 90 minutes **Maximum Marks: 50**

General instruction(s):

- Answer All Questions
- M - Max mark; CO - Course Outcome; BL - Blooms Taxonomy Level (1 - Remember, 2 - Understand, 3 - Apply, 4 - Analyse, 5 - Evaluate, 6 - Create)
- Course Outcomes:
 1. To provide basic understanding of robotics and automation.
 2. To demonstrate the need of various sensors and drives in robotic system.

Q. No	Question	M	CO	BL
1.	Two planar four-bar linkages share a common coupler as shown in Figure 1. Model all joints as revolute and compute the Degree of Freedom.  Figure 1	5		
	Calculate the Degree of Freedom of the robotic mechanism shown in Figure 2 using Kutzbach criterion.  Figure 2	5	1	3
2.	You are tasked with designing a robotic manipulator for a space exploration mission where weight, precision, and adaptability to harsh environments are critical. With neat diagrams, compare various robotic joint types which may be selected. Also evaluate their suitability for such a mission and justify your selected joint configuration. Describe the role of automation in industrial robotics and its impact on productivity using suitable illustrations.	5 5	1	2
3.	Explain the construction and working principle of a typical hydraulic actuator with a neat, labelled diagram showing its main components. Discuss the applications and advantages of hydraulic actuators compared to other types.	10	2	2



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4.	A robotic arm uses a stepper motor with a step angle of 0.9° to control its gripper rotation. The arm must rotate the gripper exactly 135° in 0.5 seconds to pick up an object. Calculate the minimum pulse frequency required to achieve this motion. If due to load, the driver can only supply 80% of the required pulse frequency, determine the new rotation achieved in 0.5 seconds. Propose a control strategy to still achieve the 135° rotation within the same time, given the hardware limitation.	10		2	3
5.	Suppose you are designing an interactive kiosk that must reliably detect user touch through a 3 mm thick glass panel. Explain which sensor would be preferred and why? Based on your identification, explain the working principle of the same with the aid of a neat diagram.	5			
	A factory is experiencing false triggering in its automated assembly line due to environmental factors affecting an inductive proximity sensor. Explain, with reference to its working principle, how an inductive proximity sensor detects metallic targets. Use suitable illustrations to justify your claim.	5		2	2
