VIT
Vellore Institute of Technology
CHENNAI

Reg. Number:	

Continuous Assessment Test (CAT) – I - AUGUST 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)	Classify the industrial manipulators based on kinematic configuration with geometric formula. [5 marks]	10
	b)	List any five major components of a robot. Highlight the data and control flow between them. [5 marks]	
2.	a)	What are the key differences between mechanization and automation? How does each of these processes impact efficiency and productivity in modern manufacturing? [5 marks]	10
	b)	Highlight the importance of characteristics in the selection of industrial manipulators. [5 marks]	
3	a)	In a large automotive manufacturing plant, hydraulic actuators are essential for operating robotic arms and machinery on the assembly line. These actuators must provide both linear and rotary motion to lift, rotate, and position heavy car components with precision. Explain how hydraulic actuators are used in the automotive manufacturing plants. Describe their working principle, focusing on how they convert hydraulic energy into mechanical motion. [5 Marks]	10
	b)	Draw a circuit diagram of the hydraulic drive system used in the above application, labelling the key components such as the pump, valves, actuators, and reservoir.[5 Marks]	
4		You are designing a robotic arm with three different-length links L1>L2>L3. The lengths are L1=1.2 meters, L2=1.0 meter, and L3=0.8 meters. Each link weighs 8 kg, 6 kg, and 4 kg respectively. The arm needs to pick up a 7 kg box from a conveyor belt and place it 1.5 meters away. The arm operates in a horizontal plane.	10

	a)	Calculate the torque required at each joint when the arm is fully extended and holding the 7 kg box. Assume gravitational acceleration is 9.81 m/s^2 [5 Marks]	
	b)	Calculate the additional torque needed at each joint if the arm moves the box with an angular acceleration of 2.0 rad/s^2. [5 Marks]	
5		A mobile robot has to travel on the given path. The path is drawn in black colour. It has to move until it sees an obstacle within the range of 1.0 meter. It has to turn 180 degree, if it encounters an obstacle in front, left and right. It has to turn left, if it encounters an obstacle in the front and right. Similarly it has to turn right, in the case of obstacle at front and left. Lamps are fixed on either side of the road. It has to measure the heat of the lamp and display it on the LED.	10
	a)	For the above given scenario, identify the suitable sensors and draw an architecture diagram. [5 marks]	
	b)	Explain the working mechanism and communication mechanism of the components. [5 marks]	

**********All the best **********

1) a) Clarify The Kinematic Configu with formula

b) 5 major Components

2) a) Key difference.

b) Manipulator, controller, end effector, power su
5 Industry manipulator - Importance ch

3) a) working principle.

b) Circuit diagram, Actuator & pump → Diagr

4) $S_1 - m*g \Rightarrow F$ 78.48, 58.86, 39.24, 68.67

Joint r $\Rightarrow \frac{54.93, 94.17, 178.194}{3}$ 228

5) Senor - Identify,

a) draw diagram architecture.

- Post Calculation.

principle of