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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (S, FE) Examination December 2024 (2019 Scheme)

Course Code: MRT302

Course Name: ROBOTICS & AUTOMATION

Max. Marks: 100 **Duration: 3 Hours**

PART A

Answer all questions, each carries 3 marks. Marks

1		What are the three laws of robotics formulated by Isaac Asimov?	(3)
2		Define the terms work volume, reachable workspace, dexterous workspace.	(3)
3		What are active and passive infrared sensors?	(3)
4		A part weighing 8lb is to be held by a gripper using friction against two opposing fingers. The coefficient of friction between the surfaces is 0.3. The orientation is such that the g factor for calculation is 3. Compute the required gripper force for the system.	(3)
5		What is the forward and reverse kinematics?	(3)
6		Write the equations for rotation about Y and X axis.	(3)
7		What are the most common types of PLC programming devices?	(3)
8		What are the advantages of PLC?	(3)
9		Write about the arithmetic functions in PLC.	(3)
10		How do you connect a PLC to computer?	(3)

PART B

Answer any one full question from each module, each carries 14 marks.

Module I

11	a)	Explain the basic robotic configuration illustrating with neat diagrams.	(14)

OR

12	a)	Explain the principle of working of hydraulic actuator and state its advantages.	(7)
	b)	What are the various types of Gears used in robotics? Explain the Spur Gears in detail with neat sketch.	(7)

Module II

13	a)	What are displacement sensors? Explain the Linear variable displacement sensors with neat diagram.	(7)

	b)	Explain the acoustical sensors used in the robotic system.	(7)

OR

14	a)	Explain the working of a magnetic end effector. What are the advantages and disadvantages?	(7)
	b)	Explain the types of mechanical grippers in robotics.	(7)

Module III

15	a)	Discuss about the mapping of description from one frame to another frame involving rotated frames.	(7)
	b)	What are the methods of robot programming? Explain the online programming method.	(7)

OR

16	a)	Derive the expression for the forward and inverse kinematics for a 2 degree of freedom robotic arm.	(14)

Module IV

17	a)	Write briefly about the configuring of a PLC.	(8)
	b)	Explain about the I/O modules used in the PLC.	(6)

OR

18	a)	Discuss in detail about the PLC principle, working with its architecture along with neat diagrams.	(14)

Module V

19	a)	Explain about timers with example using ladder programming.	(7)
	b)	Write briefly about the data transfer instruction.	(7)

OR

20	a)	What are the communication systems in a PLC? Why is it required?	(7)
	b)	Explain about interlocks used in PLC.	(7)

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