Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth Semester B.Tech Degree (R, S) Examination May 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		Define work volume of a robot manipulator. Draw the work volume of a polar coordinate robot.	(3)
2		Illustrate the degrees of freedom associated with robot wrist.	(3)
3		Give any six examples of tool as robot End effector .	(3)
4		Write any three applications of sniff sensors.	(3)
5		What are the three coordinate frames used in robotics?	(3)
6		A vector v= i+2j+3k is rotated by 45 degree about the y axis of the reference frame. Find the coordinates of rotated vector.	(3)
7		How does a PLC work?	(3)
8		Draw and explain scan cycle of PLC.	(3)
9		What is the function of RTO?	(3)
10		Interpret the symbols given below.	(3)

PART B

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

Module I

11	a)	What are the four important types of industrial robot configurations? Explain with neat sketch.	(10)
	b)	How chain drives transmit power in robots?	(4)
		OR	
12	a)	What is an actuator in robotics? Compare hydraulic and pneumatic actuators with advantages and disadvantages.	(11)
	b)	State Asimov's Three Laws of Robotics.	(3)

Module II

13 a) List any four important factors to be considered in the selection and design of grippers. (4)

b) With neat schematic diagrams, explain the working principle of potentiometer and Linear Variable Differential Transformer. (10)

OR

14 a) Suggest the type of gripper suitable for holding given below objects. (10)

i) Ferrous materials

ii) Glass sheets

Justify your answer.

b) What is the difference between internal and external state sensors? (4)

Module III

15 a) Obtain the solution of forward kinematics of a 3 degree of freedom robot. (7)

b) What are the different programming methods for robots? (7)

OR

16 a) How do you find Denavit -Hartenberg parameter table for 2 DOF robot manipulator? (14)

Module IV

17 a) What is PLC? Draw and explain PLC architecture. (11)

b) What is the role of PLC in automation? (3)

OR

18 a) Why we use PLC over relay logic? (5)

b) Compare compact and modular PLCs with diagram, advantages, disadvantages and examples. (9)

Module V

19 a) What is the purpose of a latch coil? (4)

b) State the function of PLC timer instruction. What are the three important types of timers commonly used in PLC? (10)

OR

20 a) Point out important features of Ladder logic program (4)

b) Develop a ladder logic for the following process steps. (10)

i)when START PB1 is pressed, PUMP 1 is ON and remains on even if PB1 is released.

ii) when START PB2 is pressed, PUMP 2 is ON and remains on even if PB2 is released.

iii) when START PB3 is pressed, PUMP 3 is ON until PB3 is not released.

iv) when STOP PB4 is pressed, PUMP 1 is OFF.

v) when STOP PB5 is pressed, PUMP 2 is OFF.

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