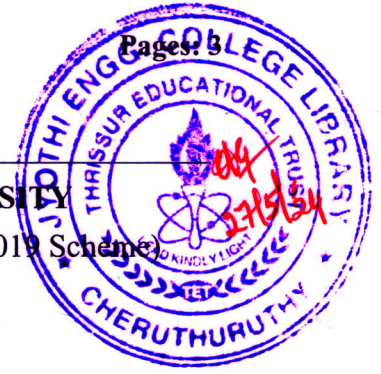


Reg No.: _____

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.
