



Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
B.Tech Degree S6 (R,S) Examinations April 2026 (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 roll, pitch and yaw. | (3) |
| 2 | State the laws of Robotics. | (3) |
| 3 | A part weighing 10lb 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) |
| 4 | Write the function of a proximity sensor. Name any two types. | (3) |
| 5 | A frame {A} is rotated 90 degree about X, and then it is translated a vector (6, 2,10) with respect to the fixed initial frame. Consider a point P=(-5,2,-12) with respect to a new frame {B}. Determine the coordinates of that point with respect to initial frame. | (3) |
| 6 | Identify the difference between forward and inverse kinematics. | (3) |
| 7 | Explain scan cycle. | (3) |
| 8 | Draw the block diagram of a PLC system. | (3) |
| 9 | Demonstrate the function of alarm in PLC? | (3) |
| 10 | Illustrate the requirements for communication networks of PLC. | (3) |

PART B

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

Module I

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|----|--|------|
| 11 | a) Describe robot motion. Draw and explain the Cartesian coordinate, Polar coordinate, and cylindrical coordinate configurations | (10) |
| | b) Define the basic anatomy of a robotic arm with neat sketch | (4) |

OR

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|----|--|------|
| 12 | a) Explain work volume? Draw the work volume of any two-robot configuration. | (10) |
| | b) Write the working principle of DC motors. | (4) |

Module II

- 13 a) With neat schematic diagrams, explain the working principle of potentiometer and Linear Variable Differential Transformer. (10)
b) Illustrate the difference between internal and external state sensors? (4)

OR

- 14 a) Describe any three gripper actuation mechanisms commonly used in robotics with neat schematic diagram? (9)
b) Show the working principle of a range sensor. (5)

Module III

- 15 a) Derive the forward and reverse kinematic equations for a robot manipulator with two degrees of freedom. (14)

OR

- 16 a) Illustrate D-H representation of a RRR robot (14)

Module IV

- 17 a) Draw and explain in detail about the PLC architecture. (10)
b) Write the capabilities of PLCs. (4)

OR

- 18 a) Develop notes on I/O modules used in PLC. (10)
b) Demonstrate how the PLC's communication interface is used. (4)

Module V

- 19 a) Draw a ladder diagram for a water level controller. (14)

OR

- 20 a) Make use of suitable examples, explain timers and counters in PLC. (14)
