

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Eighth Semester B.Tech Degree Regular Examination June 2023 (2019 Scheme)

Course Code: MET456**Course Name: ROBOTICS AND AUTOMATION****Max. Marks: 100****Duration: 3 Hours****PART A***Answer all questions, each carries 3 marks.*

Marks

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|----|---|-----|
| 1 | Explain any one application of rehabilitation robot. | (3) |
| 2 | Enumerate the major elements of an industrial robot. | (3) |
| 3 | Compare the working of internal grippers and external grippers. | (3) |
| 4 | Sketch a SCARA Robot and label the joints. Designate the robot using joint notation scheme. | (3) |
| 5 | Define base coordinate system and tool coordinate system of an industrial robot. | (3) |
| 6 | Discuss about the trajectory planning in robotics. | (3) |
| 7 | Explain the process to obtain the dynamic model of a robot. | (3) |
| 8 | Explain the velocity vectors of neighbouring links with a neat sketch. | (3) |
| 9 | Compare the working of Binary Touch Sensors and Analog Touch Sensors. | (3) |
| 10 | Enumerate the applications of machine vision system. | (3) |

PART B*Answer any one full question from each module, each carries 14 marks.***Module I**

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|----|--|-----|
| 11 | a) The present healthcare sector employs various types of robots for different tasks. Explain the applications, working and limitations of robots in healthcare. | (7) |
| | b) Compare the working of pneumatic and hydraulic drive system in an industrial robot with a neat sketch. | (7) |

OR

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|----|---|-----|
| 12 | a) Discuss about the salient features of servo motors with limitations. | (7) |
| | b) Mention the major classification of stepper motors. Illustrate the working of any one type of stepper motor. | (7) |

Module II

- 13 a) Compare the RRR and RPR mechanism with a neat sketch. Mention the DOF achieved in each case. (7)
b) Discuss about the common body and arm configuration in industrial robots. (7)

OR

- 14 a) Discuss about the description of orientation of an end effector. (7)
b) Describe the types of joints and the corresponding generated motion used in industrial robots. (7)

Module III

- 15 a) Discuss about the Denavit-Hartenberg notation. Explain the significance of kinematic joint link parameters involved in D-H notation. (7)
b) Sketch a simple 2-axis planar robot. Derive the forward kinematic equations for the robot with 2-DOF in 2D. (7)

OR

- 16 Illustrate the forward and inverse kinematics of an industrial robot with an example. (14)

Module IV

- 17 a) Obtain the Jacobian matrix for 2-DOF planar robot with 2 revolute joints. (7)
b) Explain the propagation of velocity from link to link in a manipulator. (7)

OR

- 18 Obtain equations of dynamics for RR manipulator using lagrangian method. (14)

Module V

- 19 a) Describe the classification of sensors and factors to be considered for its selection. (7)
b) Explain the principle and working of laser range finder with a neat sketch. (7)

OR

- 20 a) Compare the working of Inductive and Capacitive proximity sensors with a neat sketch. Mention any one application of each sensor. (7)
b) Discuss about the segmentation methods used in vision system. (7)
