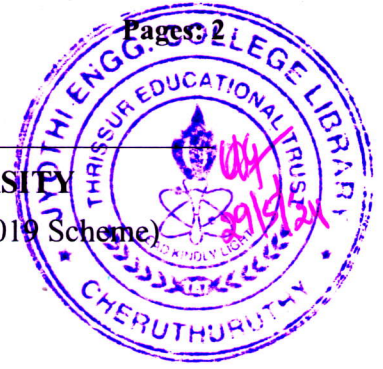


Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth Semester B.Tech Degree (R,S) Examination May 2024 (2019 Scheme)

**Course Code: AIT304****Course Name: ROBOTICS AND INTELLIGENT SYSTEM**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer all questions, each carries 3 marks.*

Marks

- | | | |
|----|--|-----|
| 1 | Explain cylindrical and spherical robot configurations. | (3) |
| 2 | State the three laws of a robot and give its applications. | (3) |
| 3 | Define the term sensor, and differentiate the same from the transducer. | (3) |
| 4 | Explain Dynamic range, Linearity and Resolution of a Sensor. | (3) |
| 5 | Differentiate between holonomic and nonholonomic robots. | (3) |
| 6 | Briefly Describe Sensing, Pre-processing, Segmentation, | (3) |
| 7 | Identify the 2 mobile robot localization problems. | (3) |
| 8 | How will you represent the error model for odometric position estimation | (3) |
| 9 | Write short notes on Potential field based path planning | (3) |
| 10 | Compare any two traversal algorithms. | (3) |

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

- | | | |
|----|---|-----|
| 11 | a) Explain the four basic robot configurations classified according to the coordinate system. | (8) |
| | b) Draw and Explain different types of grippers used in mobile robots | (6) |

OR

- | | | |
|----|---|-----|
| 12 | a) Explain the general features of wheeled, legged and aerial robots. | (9) |
| | b) Assume an object of mass 140 kg is to be lifted up with an acceleration of 10 m/s ² . Calculate the gripper force required for the operation, if coefficient of friction between contact surfaces is 0.2, number of fingers in gripper is 2 and acceleration due to gravity is 9.8 m/s ² | (5) |

Module II

- 13 a) Explain the working principle of Hall effect sensor and any one application of the same. (6)
- b) Draw and Explain position and velocity internal sensors (8)

OR

- 14 a) Briefly describe the speed and direction control of DC motor using H Bridge and PWM (6)
- b) Differentiate Stepper Motor and Servomotor concerning the construction and applications. (8)

Module III

- 15 a) Outline the seven stages of robot vision. (14)

OR

- 16 a) Derive the kinematic model of a differential drive mobile robot. (7)
- b) What is an Omni directional robot? Explain two configurations to set up an Omni directional robot. (7)

Module IV

- 17 a) How Kalman Filter method can be used in localization of mobile robots (7)
- b) Derive error model for odometric position estimation. (7)

OR

- 18 a) How the probabilistic map based localization can be achieved? And suggest the best filtering method for achieving the same. (10)
- b) List and explain the Decomposition strategies used in map representation. (4)

Module V

- 19 a) Explain Dijkstra's algorithm with a suitable example. (7)
- b) Compare and contrast local and global Dynamic window approaches in Obstacle avoidance. (7)

OR

- 20 a) Discuss the concept of Modularity for code reuse and sharing. (8)
- b) Why does SLAM work better with wheel odometer data available? (6)
