

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER M.TECH DEGREE EXAMINATION (Regular), JULY 2022**ROBOTICS AND AUTOMATION****(2021 Scheme)****Course Code: 21RA203****Course Name: Control, Programming and Calibrations of Robots****Max. Marks: 60****Duration: 3 Hours****PART A***(Answer all questions. Each question carries 3 marks)*

1. Illustrate the role of Inverse Jacobean Matrix in task space control.
2. Describe how you can direct a mobile robot to move through a line.
3. Explain the parameters used for Camera Calibration.
4. Illustrate the development of robot languages from simple motion commands in the first generation to future generation languages.
5. Define localization. List its classification.
6. Describe the importance of dead reckoning in robot localization.
7. Evaluate the frequency of calibration in robots.
8. Explain Bulls Eye?

PART B*(Answer one full question from each module, each question carries 6 marks)***MODULE I**

9. Computed torque control of a manipulator is entirely different from the PID control. Justify. (6)

OR

10. a) Illustrate the working and highlight the advantage of hybrid stepper motor. (3)
b) Demonstrate an alternative method to Lyapunov based control schemes. (3)

MODULE II

11. a) Explain the kinematic model of a quadcopter in detail. (3)
b) List and explain the parameters involved in the control of differentially driven robots. (3)

OR

12. Model a trajectory planning of a mobile robot using cubic polynomial function. (6)

MODULE III

13. a) Identify and state the exact reason for tangential distortion. (3)
b) Model the mathematical representation of radial distortion. (3)

OR

14. Explain (6)
- (i) Significance of threshold in segmentation.
 - (ii) Image interpretation.

MODULE IV

15. With a neat block diagram explain ROS communication. (6)

OR

16. Explain the different types of trajectory planning of a mobile robot using VAL language. (6)

MODULE V

17. Illustrate the concept of smooth one-dimensional trajectories with the help of MATLAB codes. (6)

OR

18. Develop a VAL program to move an RRR Robot with following steps (6)
- a. First three joints to be rotated by 200, 400, and -600 respectively.
 - b. The end effect moves to appoint 20mm apart from a point P, measured along z axis in negative direction.
 - c. The end effector reaches the point P in a straight line.
 - d. The speed limit of end effector is fixed at 50 in/sec.
 - e. The operation c is happening at 75% of the maximum permissible speed
 - f. Close the gripper.

MODULE VI

19. a) Define calibration. Explain its importance in Robotics. (3)
- b) Describe the four steps required to calibrate a robot. (3)

OR

20. a) Explain why level 1 calibration is known as joint level calibration. (3)
- b) Describe the importance of homing in calibration. (3)
