

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**SEVENTH SEMESTER B.TECH. DEGREE EXAMINATION (S), FEBRUARY 2024
ROBOTICS AND AUTOMATION
(2020 SCHEME)****Course Code : 20RBT411****Course Name: Mobile Robotics****Max. Marks : 100****Duration: 3 Hours****PART A*****(Answer all questions. Each question carries 3 marks)***

1. List any six industrial applications of a mobile robot.
2. List any three differences between localization and mapping of a mobile robot.
3. Explain an example of data fusion in mobile robots.
4. Examine three differences between visual and non-visual perception in robotics.
5. State the key classes of geometric primitives.
6. List any three applications that use hybrid control architectures.
7. Examine how a mobile robot moving in a straight line can avoid obstacles with the help of a bug algorithm.
8. Define the term path planning in the context of mobile robots.
9. List any three factors in selecting landmarks for a position estimation system.
10. List any three difficulties in using sensor-based servo control.

PART B***(Answer one full question from each module, each question carries 14 marks)*****MODULE I**

11. a) Illustrate the working of a stepper motor. (6)
b) Explain any two types of wheeled locomotion with the help of schematic diagrams representing the instantaneous centre of rotation. (8)

OR

12. a) Differentiate between tethered and wireless communication. (6)
b) Describe the key aspects that must be considered while designing a limbed locomotion mechanism. (8)

MODULE II

13. a) Differentiate between accelerometers and gyroscopes. (6)
b) Describe the process of camera calibration in perspective vision. (8)

OR

14. a) List the steps involved in designing a Kalman filter. (5)
b) Examine any three methods to abstract the features of an image. (9)

MODULE III

15. a) Illustrate the components of the control system based on horizontal decomposition. (6)
b) Differentiate between geometric representation and topological representation. (8)

OR

16. a) Examine the difference between reactive planning and map-based planning. (6)
b) Describe any four aspects in selecting the c-space of a mobile robot. (8)

MODULE IV

17. a) Illustrate the difference between homotopic and non-homotopic paths. (5)
b) Classify the search algorithms used in robot path planning. (9)

OR

18. a) Define spatial uncertainty and evaluate how it can affect robot path planning. (6)
b) Demonstrate the retraction methods in path planning with the help of an example. (8)

MODULE V

19. a) Examine the three matching methods used in localization. (6)
b) Demonstrate the working of recursive filtering in mobile robots. (8)

OR

20. a) Differentiate between geometric model-based pose estimation and perceptual pose estimation. (8)
b) Explain the steps involved in on-line localization of mobile robots. (6)
