Register No: …………………… Name: ....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)
(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)
EIGHTH SEMESTER B.TECH DEGREE EXAMINATION(R), MAY 2024
Robotics and Automation
(2020 SCHEME)

Course Code	:	**20RBT442**	
Course Name	:	**Robot Motion Planning**	
Max. Marks	:	**100**	**Duration:3 Hours**

PART A
(Answer all questions. Each question carries 3 marks)

1. Differentiate between a configuration space and a workspace.

2. List the classes of algorithms that need to be considered while implementing robot motion planning.

3. Differentiate between polygonal space GVD and grid-based GVD.

4. List the limitations of the visibility graph.

5. Examine the advantages of advanced path planning techniques over conventional approaches.

6. List the advantages of using Query sampling path planners.

7. Evaluate the application of the bug algorithm.

8. Explain the term assembly planning.

9. List the properties of configuration space of an articulated robot.

10. List the decomposition techniques in approximate cell decomposition.

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

11. a. Differentiate the motion planning approaches for a fixed manipulator and a wheeled mobile robot. — 7

b. Consider the case study of the rover "Pragyan" in Chandrayan Mission. Examine the motion planning strategies involved in its design. — 7

OR

12. (a) Illustrate the principle of bijective mapping and examine its difference with injective mapping. — 10

(b) Define the term homeomorphism. — 4

MODULE II

13. (a) Outline the steps involved in constructing a sensor-based GVD. — 9

(b) Construct a Voronoi diagram considering the point obstacles at (2,1) and (8,6) in a two-dimensional space. — 5

OR

14. (a) Illustrate the types of roadmaps with the help of an example. — 8

(b) Examine the properties that need to be satisfied for a union of the one-dimensional curve to be — 6

defined as a roadmap.

MODULE III

15. (a) Differentiate between probabilistic roadmap and normal roadmaps.   10
    (b) Explain the principle of Dijkstra algorithm.   4

OR

16. (a) Outline the steps involved in constructing the Rapidly Exploring Random Trees algorithm.   10
    (b) List the advantages of the probabilistic roadmap approach.   4

MODULE IV

17. (a) Outline the construction of the bubble band technique.   8
    (b) Differentiate between bubble band technique and curvature velocity techniques.   6

OR

18. (a) Outline the construction of the D* algorithm with the help of a neat diagram.   8
    (b) Differentiate between A* and D* algorithms.   6

MODULE V

19. (a) Differentiate between the process of motion planning in a simple configuration space and composite configuration space.   8
    (b) Examine the challenges involved in multiple robot motion planning.   6

OR

20. (a) Examine the porcess of exact cell decomposition in robot motion planning.   10
    (b) List the significance of motion planning in dynamic configuration space.   4

****