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**Presidency University**

**Bengaluru**

**SCHOOL OF ENGINEERING**

**SUMMER TERM EXAMINATION**

**Course Code**: MEC 3099

**Course Name**: Autonomous Mobile Robots

**Program & Sem**: B. Tech

**Date**: 06 AUGUST 2024

**Time**: 9.30 AM to 12.30 PM

**Max Marks**: 100

**Weightage**: 25%

**Instructions:**

1. *Read the all questions carefully and answer accordingly.*
2. *Draw the Diagrams where ever it is necessary.*

**Part A [Memory Recall Questions]**

**Answer any Five Questions. Each question carries 2 marks. (5Qx 2M= 10M)**

1. Define configuration space. (C.O.No.2) [Knowledge]

2. Define Direct and Inverse kinematics. (C.O.No.2) [Knowledge]

3. Define perception in terms of robots. (C.O.No.3) [Knowledge]

4. Write a short note on Legged robots. (C.O.No.3) [Knowledge]

5. What is Localization? (C.O.No.3) [Knowledge]

6. Write a short note on wheel geometry. (C.O.No.4) [Knowledge]

7. What are vision based sensors? (C.O.No.4) [Knowledge]

**Part B [Thought Provoking Questions]**

**Answer any Five Questions. Each question carries 10 marks. (5Qx10M=50M)**

8. With suitable examples explain Holonomic and Non-holonomic drives. (C.O.No.3) [Application]

9. List and explain three functions of Robot vision system. (C.O.No.3) [Application]

10. Explain In-situ performance of robots. (C.O.No.2) [Comprehension]

11.With suitable example explain the working of Global Positioning system.

(C.O.NO.2) [Application. Level]

12. Define perception and with suitable diagram explain the process of perception.

(C.O.No.3) [Application]

13. With suitable block diagram explain Kalman Filter Localization. (C.O.No.3) [Application]

14. With suitable diagram explain Belief representation of robots? (C.O.No.4) [Application]

**Part C [Problem Solving Questions]**

**Answer any Two Questions. Each question carries 20 marks. (2Qx20M=40M)**

15. The configuration space is a transformation from the physical space in which the robot is of finite-size into another space in which the robot is treated as a point. In other words, the configuration space is obtained by shrinking the robot to a point, while growing the obstacles by the size of the robot. With suitable example explain configuration space of a robot movement in 2D and 3D plane. (C.O.No.3) [Application]

16. Locomotion is defined as the act of exhibiting various motions such as running, walking, jumping, crawling, swimming, etc by the body that cause a change in the position of the body. The movement of an organism from one place to another is also termed locomotion. With suitable examples list and explain different types of robot locomotion. (C.O.No.3) [Application]

17. Localization is one of the most fundamental competencies required by an autonomous robot as the knowledge of the robot's own location is an essential precursor to making decisions about future actions. With suitable block diagram explain the process of Localization.

(C.O.No.3) [Application]