11/12/2023 - FN

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 70063

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Seventh Semester

Artificial Intelligence and Data Science

AD 8705 – AI AND ROBOTICS

(Regulations 2017)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Quote any four basic capabilities of computers required to develop the AI module.
2. Write a typical specifications of biped mobile robot.
3. How a mobile robot differs from manipulator?
4. Write the relation for orthogonal rotation matrix with simple diagram.
5. Classify the sensors used in mobile robots with example.
6. Write the equation for Gaussian distribution.
7. Write down any two critical issues through aliasing of sensor.
8. Classify the three types of errors encountered during operation of sensors.
9. Briefly explain the concept of completeness in case of path planning decision.
10. Write an equation for parabolic attractive potential function.

PART B — (5 × 13 = 65 marks)

11. (a) Describe the stability, maneuverability and controllability issues in connection with mobile robots.

Or

(b) Explain the four wheel configuration arrangements for rolling vehicle with suitable schematic diagrams.

12. (a) Illustrate a simple forward kinematic model using suitable sketch with respect to global reference.

Or

(b) Describe the kinematic model control of open loop and feedback motion control for mobile robots.

13. (a) Explain the different performance characterization parameters of sensors with suitable example.

Or

(b) Describe the simplified and general model of perspective projection of a camera reference.

14. (a) Explain the general concept of mobile robot localization with block diagram.

Or

(b) Describe the behavior-based and map-based navigation architecture with suitable block diagram.

15. (a) Illustrate the Bug algorithm for obstacle avoidance task with a simple environment. Also give its limitations.

Or

(b) Explain the principle of potential field path planning algorithm with flow chart.

PART C — ($1 \times 15 = 15$ marks)

16. (a) Suggest a more viable obstacle avoidance algorithm for mobile robotic environment by considering the dynamic environment. Give your justification for your selection.

Or

(b) Illustrate the working principle of voronoi diagram and exact cell decomposition path planning strategies with simple environment diagram. Also, compare its advantages and limitations.
