[6263]-349

B.E. (Robotics and Automation)
FIELD AND SERVICE ROBOTS
(2019 Pattern) (Semester - VIII) (411508)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:
1) *Answer Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q.6, Q. 7 or Q. 8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Use of calculator is allowed.*
5) *Assume suitable data if necessary.*

Q1) a) How does incorporating intuitive interfaces into Personal Service Robots contribute to improving the overall user experience? **[9]**

b) How does effective planning within uncertainty play a crucial role in boosting the reliability of robotics in healthcare? **[9]**

OR

Q2) a) Provide an in - depth explanation of the design and functionality of a lightweight autonomous climbing robot tailored to assist elderly and disabled individuals? **[9]**

b) Elaborate on the advanced features and functionalities of the robotic library system specifically engineered for remote shelving facilities? **[9]**

Q3) a) What are the core principles behind the development of a pneumatically controlled expandable arm for searching in environments with limited access? Additionally, what are some defining features of the Distal Expandable Tube? **[9]**

b) What role do spraying robots play in promoting sustainability within grape production? Explore both the environmental and economic advantages they offer in contrast to conventional spraying methods. **[9]**

OR

Q4) a) In what ways does the utilization of robot and sensor teams for distributed search and rescue operations enhance response efficiency during emergency situations? Provide a concise overview. **[9]**

b) Provide a detailed explanation of the process involved in developing mobile robots specifically designed for search and rescue operations? **[9]**

Q5) a) Discuss the difficulties inherent in landing an autonomous helicopter on a moving target and elaborate on the strategies implemented to mitigate these challenges, along with an assessment of their efficiency? **[9]**

b) Provide a concise overview of the procedure involved in acquiring helicopter control knowledge from a pilot for autonomous flight? Additionally, discuss the main experimental methods employed in this field and their resulting outcomes? **[8]**

OR

Q6) a) What is the significance of real-time navigation, guidance, and control for UAVs, and how are these capabilities achieved using affordable sensors? Additionally, outline the techniques employed to enable real-time functionality and their impact on UAV performance? **[9]**

b) What is the importance of compact millimeter-wave radar sensors for unmanned UAVs? Provide a concise overview of their characteristics and uses, highlighting how they influence UAV operations? **[8]**

Q7) a) Elaborate on the significance of designing a multi-functional eight-legged robot for the evaluation of neural interfaces? Additionally, provide a concise overview of the robot's structure and capabilities, and assess its potential applications in the field of neural interface technology evaluation? **[9]**

b) Elaborate on the importance of seamless human-robot interaction when utilizing an interactively operated service robot for skilled tasks? Furthermore, discuss the difficulties faced and potential strategies for enhancing cooperation between humans and robots within environments requiring specialized expertise? **[8]**

OR

Q8) a) Provide a brief discussion on how combining road scene monitoring with vehicle control contributes to enhanced road safety? Additionally, highlight the main technologies and methodologies used to achieve this integration? **[9]**

b) Provide a brief explanation of the concept of real-time interactive presence-building and its significance in human-robot interaction? Furthermore, outline the methodologies utilized for constructing building of presence online and examine their implications for the development of immersive virtual environments? **[8]**

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