H1 **1000RAT495112401** **Pages: 2**

Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech (Hons.) Degree Examination December 2024 (2021 Admission)

Course Code: RAT495

Course Name: FIELD ROBOTICS

Max. Marks: 100 **Duration: 3 Hours**

PART A

Answer all questions, each carries 3 marks. Marks

1	Define wheeled mobile robots and their significance in agricultural applications.	(3)
2	What is localization in the context of mobile robotics? Provide an example.	(3)
3	Outline any 3 types of errors associated with GPS.	(3)
4	What do you mean by sensor fusion and why is it essential in AGVs?	(3)
5	Explain the terms roll, pitch and yaw in terms of flight of an UAV.	(3)
6	State two advantages and two disadvantages of UAVs.	(3)
7	What is the Free Space Optical (FSO) communication approach and where is it used?	(3)
8	List two types of UAV communication infrastructure and briefly describe their use.	(3)
9	Define a rescue robot and state two of its key characteristics.	(3)
10	State two reasons for rescue robot terminal failures.	(3)

PART B

Answer any one full question from each module, each carries 14 marks.

Module I

11	a)	Elaborate on the role of wheeled mobile robots in industries, focusing on localization and mapping techniques, path planning and decision-making strategies.	(14)

OR

12	a)	Describe the components of autonomy, control strategies, feedback loops and steering control using the point mass model in autonomous ground vehicles.	(14)

Module II

13	a)	Explain the system architecture of an autonomous ground vehicle (AGV) with a neat block diagram.	(14)

OR

14 a) Describe with a block diagram, a representative vehicle sensing system for external environment sensing. (7)

b) Explain hybrid system formulation in AGVs. (7)

Module III

15 a) Describe in detail the working of an UAV with necessary diagrams. (14)

OR

16 a) Explain the concept of autonomy in UAVs and describe the measures of autonomy, ranging from remotely piloted systems to fully autonomous UAVs. (14)

Module IV

17 a) Describe the working of intelligent flight control systems in UAVs. How do these systems ensure stability, autonomy and fault tolerance during flight? (14)

OR

18 a) Explain the role of Wireless Sensor Networks in UAV communication. How do WSN systems improve UAV performance in real-time applications like environmental monitoring? (14)

Module V

19 a) Describe the role of rescue robots in managing various types of disasters, such as earthquakes, floods, and industrial accidents. Provide relevant examples. (14)

OR

20 a) Explain the operational classification of agricultural robots. Describe their roles in precision agriculture and farm management. (14)

****