Name: Enrolment No:	UPES UNIVERSITY OF TOMORROW

UPES
End Semester Examination, May 2024

Programme Name : B.Tech (Mechatronics Engg.)   Semester   : VIII
Course Name   : Industrial and Service Robots   Time   : 03 hrs
Course Code   : ECEG7030   Max. Marks: 100
Nos. of page(s) : 2

Instructions: All the sections are mandatory.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Describe the present status and future trends in service robotics.	4	CO1
Q 2	Explain the A* algorithm for global path planning.	4	CO1
Q 3	Explain the particle filter and its role in robot localization.	4	CO1
Q 4	Interpret and explain the concept of robot maneuverability and workspace.	4	CO2
Q 5	Find the Transformation matrix of a mobile robot that to point P $[1, 1, 0]^T$ relative to the reference frame after a rotation of 30∘.	4	CO2

SECTION B
(4Qx10M= 40 Marks)

Q 6	Explain the following terminologies. a) Hybrid Maps. b) Metrical Maps.	10	CO2
Q 7	Design a hydraulic circuit diagram for an industrial robot using a proportional valve-controlled hydro-motor drive for drilling in a steel block.	10	CO3
Q 8	Create a schematic flow chart for a mobile robot used in plant material handling. Compare AGVs and AMRs used in material handling.	10	CO3
Q 9	Analyze the fundamental principles of obstacle avoidance algorithm using sensor data.	10	CO4

	"OR" Compare and contrast the key features and limitations of Bayes filter and Kalman filter for a robot localization.		
SECTION-C **(2Qx20M=40 Marks)**			
Q 10	Evaluate and analyze the concept of SLAM (Simultaneous Localization and Mapping) and its applications in robotics. Explain the importance of SLAM in robotics and its potential impact on robotic systems. *"OR"* Critically analyze and evaluate the A* algorithm in the context of robot path planning. Explain the components and parameters of the A* algorithm and examine their impact on the algorithm's computation.	**20**	**CO4**
Q 11	Discuss the deployment challenges associated with a probabilistic map-based localization algorithm. Evaluate the effectiveness of the Monte Carlo localization technique for robot localization.	**20**	**CO5**