

II SEMESTER M.TECH. (INDUSTRIAL AUTOMATION AND ROBOTICS) END SEMESTER EXAMINATION, JUNE 2022

SUBJECT: MOTION CONTROL AND PATH PLANNING SYSTEM [MTE 5253]

Date of Examination: 27 June 2022

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

✤ Answer ALL the questions.

✤ Data not provided may be suitably assumed

Q. No.	Question	Μ	CO	РО	LO	BL
1A.	Solve & Derive the forward and inverse kinematics for mobile	5	CO3	2,5	M3	3
	robots in terms of displacement and velocity with respect to					
	inertial and body coordinate frames appropriately.					
1B.	Define Trajectory Planning? Explain the third-order	03	CO3	1	M3	1
	polynomial trajectory planning.					
1C.	Determine the degree of maneuverability for the below figure	02	CO3	2	M3	4
	given:					
2A.	Determine the angular velocity of all the four wheels in the figure given below.	05	CO3	2	M3	4
	Figure No.: Q-2A					

2 B .	Illustrate the Classical Path Planning Approaches	3	CO3	1,2	M3	2
2C.	Signify the challenges with Potential Fields	2	CO3	1	M3	
3A.	Explain below algorithms with neat sketches	5	CO4	1	M4	4
	a. Probabilistic Road Maps					
	b. Rapidly random exploring trees					
	c. Dijkstra Algorithm					
3B.	Define the manipulation planning and optimal motion	3	CO4	1,	M3	1
	planning			12		
3C.	Explain the visibility graph with the help of a neat sketch.	2	CO2	2	M1	4
4A.	Explain the reduced visibility graph with the help of a neat	2	CO2	2	M1	4
	sketch.					
4B.	Apply Wavefront planner algorithms to find the shortest path	4	CO2	5	M3	3
	between two-point Consider the 4-point connectivity. Where S					
	between two point. Consider the ' point connectivity, where b					
	is for source point, 1 is for obstacle and D is for Destination					
	and blank cells are the free space.					
	7 S					
	6					
	5 1 1 1 1 1 1					
	4 1 1 1 1 1					
	3 1 1 1 1 1					
	2					
	1					
	0 D					
	$\begin{smallmatrix} 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 & 12 & 13 \end{smallmatrix} $					
4C.	Explain the autonomous robot action cycle with the help of a	4	CO1	1,2	M1	3
	neat sketch. Describe the following robotic control strategies					
	with block diagrams					
	i. Classical AI					
	ii. New AI	2	COL	2	Ma	1
5A.	Define robotic end effector, enlist and describe 4 robotic end	2		2	1012	1
5 D	effectors used in the industry.	Δ	CO1	5	M2	2
5B .	Sketch and explain the Schematic diagram of a robot system.	-		5	1712	5
50	Also, emist the reason for the use of robots in industry.	4	C01	1.2	M2	3
5 C.	Explain with the Diagram	-			1714	5
	1. AIIICUIAICU KODOl ii Salaatiya Compliance Accomply Debat Arm					
	n. Selective Comphance Assembly Kobot Arm					
	(JCARA)					