Reg. No.



# MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent institution of MAHE, Manipal)

## VII SEMESTER B.TECH. (MECHATRONICS ENGINEERING)

# END SEMESTER EXAMINATIONS, DEC 2018

SUBJECT: ROBOT PATH PLANNING [MTE 4008]

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#### Time: 3 Hours

#### MAX. MARKS: 50

## Instructions to Candidates:

- ✤ Answer ALL the questions.
- ✤ Data not provided may be suitably assumed with justification.

1A.	For a Depth First Search (DFS), identify the actions for the graph given in Fig. 1A. $ \begin{array}{c}                                     $	2
1 <b>B</b> .	Design the algorithm for weighted A*.	3
1C.	Formulate the time complexity analysis of the recursive of a factorial of a positive integer.	5
2A.	Contemplate on the pseudocode of RRG.	5
<b>2B.</b>	Analyze the probabilistic road map.	5
3A.	It is desired to have the first joint of a 6-axis robot go from initial angle of $30^0$ to a	5
	final angle of $75^{0}$ in 5 seconds. Using third-order polynomial, calculate the joint angle at 1, 2, 3, and 4 seconds.	
3B.	Discuss the algorithm for ARA*.	3
<b>3</b> C.	Explain control based planning.	2
4A.	With a neat sketch, interpret the degrees of freedom of a coin lying on a table.	5
4B.	Demonstrate $f(x) = 3x - 2$ is injective for all $x \in I$ (an integer). What about for all $x \in Z$ .	3

4C.	Analyze the important classes of bijective mappings.	2
5A.	Analyze the decoupled trajectory planning.	5
5 <b>B</b> .	Contemplate on the critical points of Generalized Voronoi Graph (GVG)	2
<b>5</b> C	Formulate the basics of trajectory planning	3