



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

	InSem Examination-I Winter 2023		
	Exam Seat No.:		
	Academic Year: 2023-2024	Semester: III	
	Name of Programme: S.Y. B.Tech	Pattern:2022	
	Name of Course: Robot Path Planning	Course Code:ROB222005	
	Max. Marks:30	Duration: 1 hr	

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 3 pages.
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question

Question No. 1 Attempt following Question

- a) What are the different aspects of motion planning? Explain with suitable example. (4) CO1

OR

- b) Explain why Racetrack is not diffeomorphic to a circle. (4) CO1
- c) What is Configuration Space? Explain Topology of Configuration space for circular mobile robot with obstacle. (5) CO1

OR

- d) Explain the components of Quaternions. What are unit quaternions? (5) CO1
- e) Explain the concept of paths connectedness with diagram of three scenario: i) The presence of a path connecting the start point to the goal point, ii) The absence of a path between the start point and the goal point, and iii) A scenario where a path exists and has wrapping around a torus. (6) CO1

OR

- f) Explain the concept of topology. What is homeomorphisms and diffeomorphisms. (6) CO1

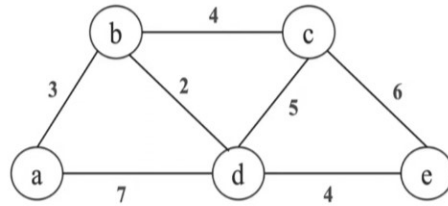
Question No. 2 Attempt following Question

- a) Explain the Roadmap Approach in the robot path planning. What are Accessibility and Departability associated with a roadmap? (4) CO2

OR

- b) Explain the steps involved in constructing a Voronoi diagram using the sweep line method. (4) CO2

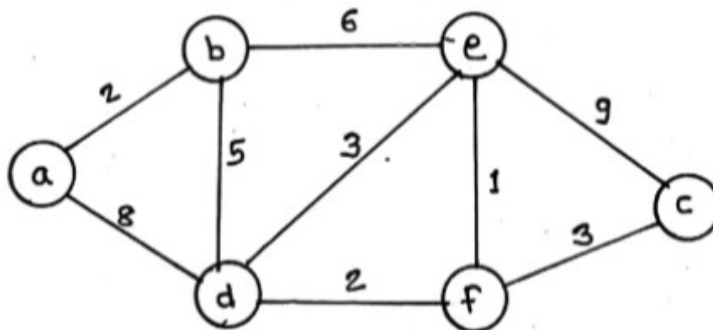
- c) Find the shortest path from node a to all other vertices, using Dijkstras algorithm.



(5) CO2

OR

- d) Find the shortest path from node a to all other vertices, using Dijkstras algorithm.

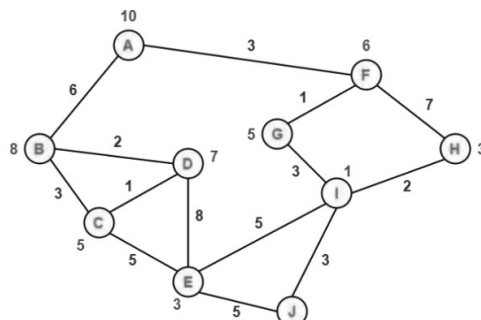


(5) CO2

- e) Find the most cost effective path to reach from start state A to final state J using A* Algorithm. (6) CO2

The numbers written on edges represent the distance between the nodes.

The numbers written on nodes represent the heuristic value.



OR

f)

Find the shortest path using A* algorithm.

State	Heuristic : h (n)
S	5
A	3
B	4
C	2
D	6
G	0

(6) CO2

