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 key steps involved in the path planning process for robots?	(4)	CO1
	OR		
b)	What is the stereographic projection parameterization for representing 2D rotations in SO(2)	(4)	CO1
c)	What is Configuration Space? Explain Topology of Configuration space for two link manipulator with obstacle.	(5)	CO1
	OR		
d)	Explain the concept of homeomorphism with diagram? How does it relate to the properties of Injectiveness and surjectiveness of a mapping?	(5)	CO1
e)	What is the representation of following different types of robot: i. Mobile robot translating in the plane ii. Mobile robot translating and rotating in the plane iii. Rigid body translating in the three-space iv. A spacecraft v. An n-joint revolute arm vi. A planar mobile robot with an attached n-joint arm	(6)	CO1

OR

f) What is the configuration of a polygonal (Right angled triangle) robot in a 2D workspace and how is it typically represented when:
case i) theta angle is zero degree and
case ii) theta angle 45 degree? (6) CO1

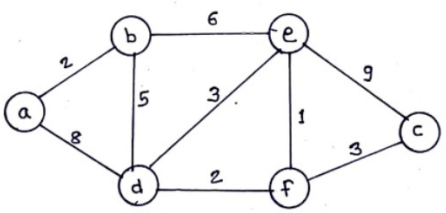
Question No. 2 Attempt following Question

a) How does the concept of a visibility graph contribute to efficient path finding in environments with obstacles? (4) CO2

OR

b) What do the terms 'separating lines' and 'supporting lines' mean in the reduced visibility graph. Explain with diagram. (4) CO2

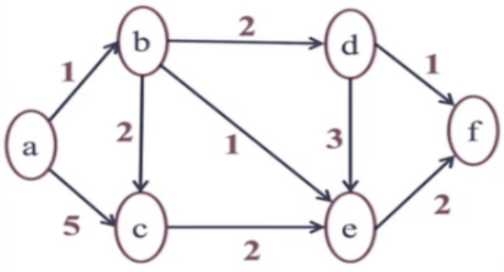
c) Find the shortest path from node a to all other vertices, using Dijkstras algorithm.



(5) CO2

OR

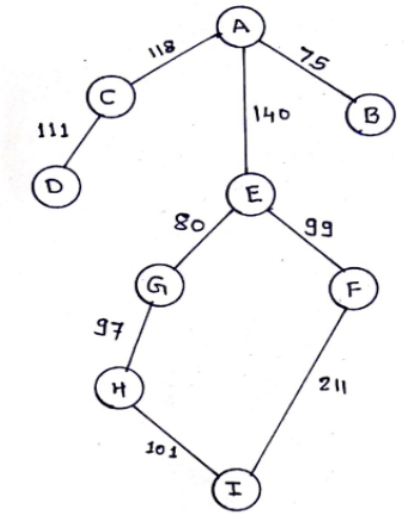
d) Find the shortest path from node a to all other vertices, using Dijkstras algorithm. (5) CO2



e)

Find the shortest path using A* algorithm.

State	Heuristic : h (n)
A	366
B	374
C	329
D	244
E	253
F	178
G	193
H	98
I	0



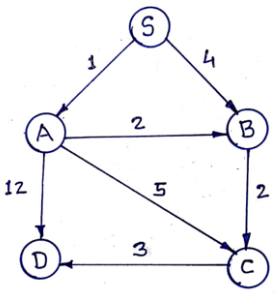
(6) CO2

OR

f)

Find the shortest path using A* algorithm.

State	Heuristic : h (n)
S	7
A	6
B	2
C	1
D	0



(6) CO2