Name: **Enrolment No:**	

UPES

End Semester Examination, December 2024

Course: Foundation of Cognitive Robotics **Semester: III**

Program: M. Tech (Robotics Engineering) **Time : 03 hrs**

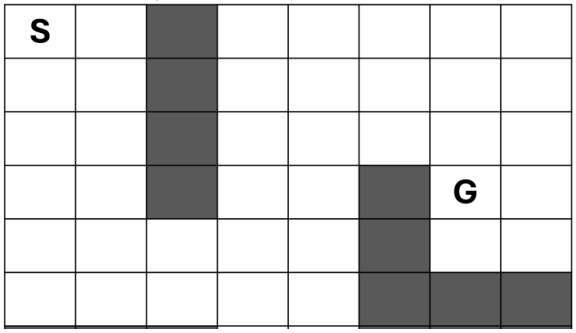
Course Code: ECEG8023 **Max. Marks: 100**

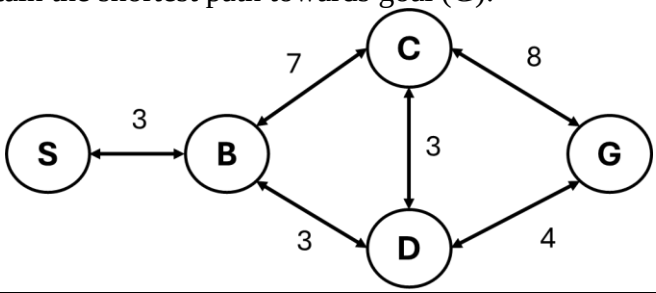
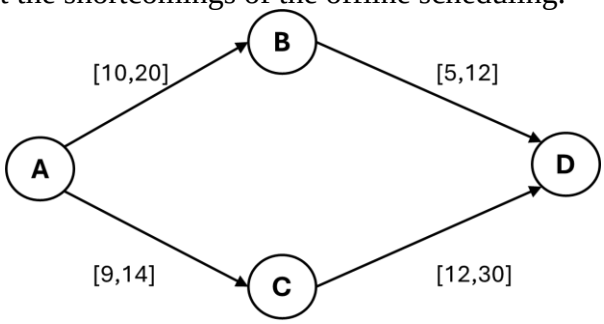
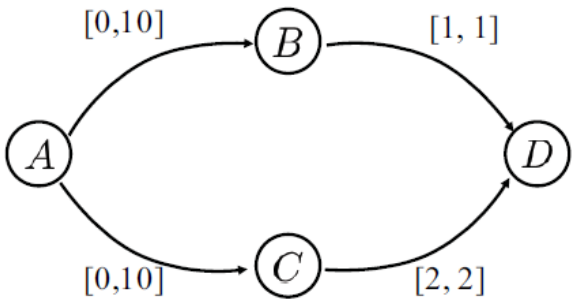
Instructions: Attempt all the questions. Assume any missing data. Read all the instructions carefully

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	For a mecanum wheel robot, identify the capabilities that enable its transformation into a cognitive robot?	**4**	**CO1**
Q 2	List the various incremental path planning algorithms.	**4**	**CO1**
Q 3	Illustrate Planning Domain Definition Language (PDDL) temporal action with suitable example.	**4**	**CO3**
Q 4	Describe Temporal Plan Network (TPN)? For which kind of problems are they beneficial?	**4**	**CO2**
Q 5	Distinguish between Simple Temporal Network (STN) and Temporal Plan Network (TPN)?	**4**	**CO2**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Explain the motivation for using Linear Temporal Logic (LTL) in planning, with an example of a self-driving car following traffic lights.	**10**	**CO2**
Q 7	Illustrate how different choices influence the execution of a Temporal Plan Network, with a suitable example.	**10**	**CO2**
Q8	Describe the process of incremental path planning for the given grid map, where free cells are shown in white, obstacles are represented by grey cells, the Start cell is marked as S, and the Goal cell is marked as G. 	**10**	**CO2**

Q 9	Describe the alpha-beta pruning algorithm procedure. Explain the role of alpha and beta values in the alpha-beta pruning technique **Or** How does alpha-beta pruning enhance the performance of the Minimax algorithm in two-player games, such as Tic-Tac-Toe? Explain the process and the benefits of pruning in reducing the number of nodes evaluated during the search	**10**	**CO3**
SECTION-C (2Qx20M=40 Marks)			
Q 10	Evaluate the shortest path using D* lite algorithm from Start Node(S) to goal node(G). On the go when robot reaches to node (B) identifies node (D) as obstacle, obtain the shortest path towards goal (G). 	**20**	**CO2**
Q 11	Explain offline scheduling for STN. Obtain the offline schedule for the given STN. Also, list the shortcomings of the offline scheduling.  **Or** Illustrate the advantage of dynamic scheduling in STN. For the following STN obtain the dynamic scheduled plan to execute the temporal plan. 	**20** **20**	**CO3**