Roll No: ----------

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2018

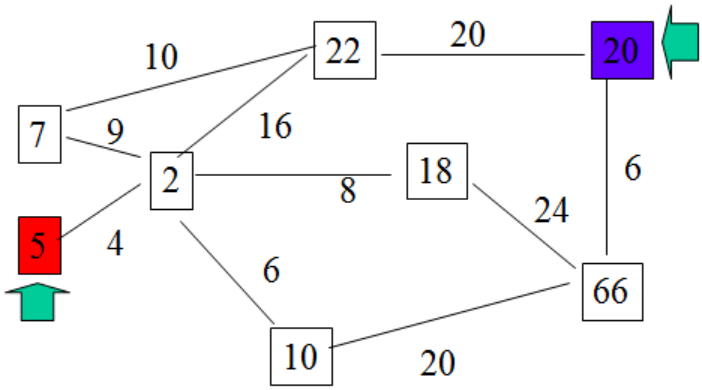
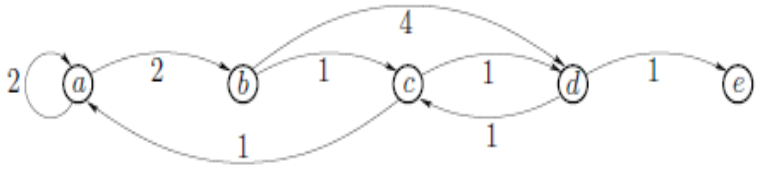
Program: B.Tech ASE (UAV) **Semester – II**

Subject (Course): Path Planning and Obstacle Avoidance for Unmanned Vehicles **Max. Marks : 100**

Course Code : AVEG 7005 **Duration : 3 Hrs**

No. of page/s:

Section A (Attempt ALL questions) (5X4M =20 Marks)			
		Marks	Course Objective
1	Discuss in detail the role of planners in developing an algorithm.	**4**	**CO1**
2	How does an arbitrary line drawn between machine and the environment effect the algorithm developed	**4**	**CO1**
3	Explain the use of P, PI and PID controllers in cruise control of autonomous cars and how these controllers affect the output (velocity) of the vehicle.	**4**	**CO2**
4	What are the queues created in case of general forward search algorithms	**4**	**CO1**
5	Discuss in detail the DFS algorithm with an example	**4**	**CO2**
Section B (Attempt ALL questions) (4X10M =40 Marks)			
6	What is backward value iteration and derive the expression for the optimal cost-to-go computed by backward value iteration	**10**	**CO5**
7	Discuss in detail a generalized formulation for the discrete optimal planning for specified/ fixed lengths.	**10**	**CO3**
8	STRIPS-like representations have been the most common logic-based representations for discrete planning problems. This refers to the STRIPS system, which is considered one of the first planning algorithms and representations, show in detail the formulation for STRIPS based representation and elaborate in detail the variables used.	**10**	**CO5**

9	It is convenient to summarize the behavior of all search methods in terms of several basic steps. Variations of these steps will appear later for more complicated planning problems. Develop a generalized formulation for unified view of search methods.	**10**	**CO3**
	Section B (Attempt ALL questions) **(2X20M =40 Marks)**		
11	Explain the Dijkstra forward search algorithms with the given example, explain how the queue is formed 	**20**	**CO4**
12	In a five-state example as given in figure below. Each vertex represents a state, and each edge represents an input that can be applied to the state transition equation to change the state. The weights on the edges represent $l(x_k, u_k)$ (x_k is the originating vertex of the edge). Obtain the optimal cost to go using Forward Value Iteration. 	**20**	**CO4**

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Section A (Attempt ALL questions) (5X4M =20 Marks)			
		Marks	Course Objective
1	Discuss the algorithm that specifies Q as a First-In First-Out (FIFO) queue, which selects states using the first-come, first-serve principle.	**4**	**CO2**
2	Explain in detail the Dead, Unvisited and Alive states.	**4**	**CO1**
3	In discrete feasible planning describe the following: a. State Space b. State Transition Function c. Action Space	**4**	**CO2**
4	What are the salient points of feature point selection with respect to feature based approach?	**4**	**CO1**
5	Discuss in detail the formulation and algorithm of discrete feasible planning	**4**	**CO5**
Section B (Attempt ALL questions) (4X10M =40 Marks)			
7	Explain the concept of algorithm with the help of Turning machine model. Explain in detail the interaction with machine and the environment through actuation and sensing.	**10**	**CO1**
8	Imagine a planning problem that involves putting two batteries into a flashlight, Define three operators for the flashlight problem. Note that an operator can be expressed with variable argument(s) for which different instances could be substituted.	**10**	**CO2**

9	Use the below mention search algorithms and design an algorithm to determine the cost to go a. Forward search b. Backward search c. Bidirectional search	**10**	**CO3**
10	With the help of an example, explain in detail the difference between breadth first search and depth first search algorithms. OR Explain the generalized of Dijkstra revisited algorithm, which upon termination produces an optimal plan (if one exists) for any prioritization of Q, as long as X is finite	**10**	**CO4**
Section B (Attempt ALL questions) (2X20M =40 Marks)			
11	Implement A*, breadth-first, and best-first search for grid-based problems. For each search algorithm, design and demonstrate examples for which one is clearly better than the other two	**20**	**CO4**
12	Dijkstra's algorithm was presented as a kind of forward search, a. Develop a backward version of Dijkstra's algorithm that starts from the goal. Show that it always yields optimal plans. b. Describe the relationship between the algorithm from part (a) and the backward value iterations from Section	**20**	**CO4**