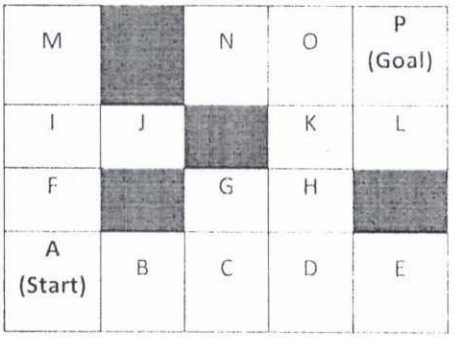
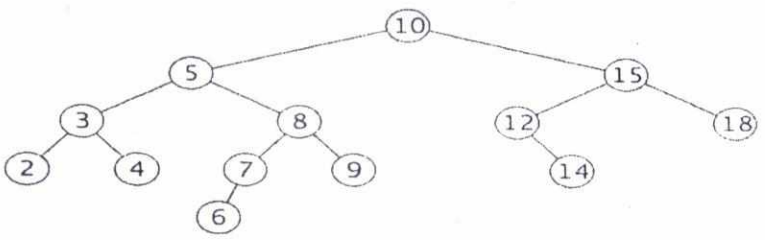
Roll Number:	
Thapar Institute of Engineering and Technology, Patiala	
Computer Science and Engineering Department	
BE(2nd Year) March 30, 2022 MST	UCS411: Artificial Intelligence
Time: 2 Hours	Marks:35
Instructors: Dr. Singara Singh Kasana, Dr. Jasvinder Pal Singh, Dr. Jayendra Barua, Dr. Sujata, Dr. Seema, Ms. Swati	

Note: Attempt any 5 questions. All parts of a question must be answered in order.

Q1 a	Given following Grid World. Suppose a robot is at cell A and it wants to go to cell P. The robot can only move horizontally and vertically in the Grid world. The robot can only sense horizontally and vertically located neighbour cells. The black marked cells in the grid are obstacles. Robot cannot go on obstacles.  Given three types of AI Agents 1) Simple Reflex, 2) Goal Based and 3) Utility based, Where would you put the Robot among the three and why?	[3]
Q1 b	Show the PEAS of the problem given in Q 1(a).	[4]
Q2 a	Find the search path to node 14 using DFS algorithm. Consider 10 as start node and show all intermediate steps.  	[5]
Q2 b	Discuss in details the limitations of Hill climbing searching algorithms.	[2]
Q3	Consider the following farmer, wolf, goat and cabbage problem: A farmer with his wolf, goat, and cabbage come to the edge of a river they wish to cross. There is a boat at the river's edge, but, of course, only the farmer can row. The boat also can carry only two things (including the rower) at a time. If the wolf is ever left alone with the goat, the wolf will eat the goat; similarly, if the goat is left alone with the cabbage, the goat will eat the cabbage. Represent the problem as a state space search by showing initial state, goal state, intermediate states, actions and solution steps.	[7]

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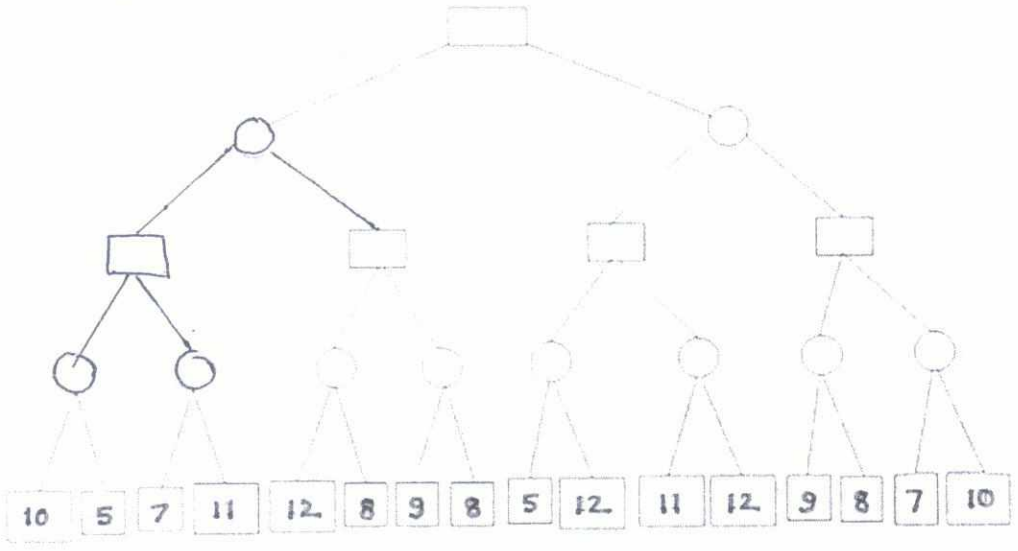
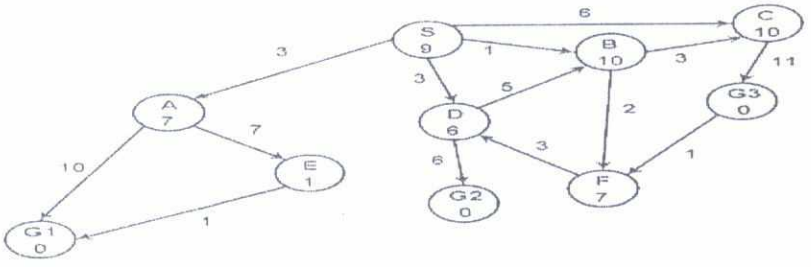
Q4 a	Discuss the differences between Best First Search and Steepest Hill Climbing Algorithm.	[2]
Q4 b	Apply alpha beta pruning on the following tree by showing all intermediate values. Consider root node as max node. 	[5]
Q5	Suppose a genetic algorithm uses chromosomes of the binary form with a fixed length of five genes. Each gene can be any digit 0 or 1. Let the fitness of individual x be calculated as: $$f(x_i) = \frac{100}{|(3n_1 - 2n_0)| + 1} + k$$ where n_1 = number of ones, n_0 = number of zeros in the string and k is the decimal value of solution x_i. Let the initial population consist of four individuals with the following chromosomes: x_1 = 10111, x_2 = 00111, x_3 = 01001, x_4 = 01000 Select the first and second fittest as it is in the next iteration and perform the two-point crossover after points (2 and 4) followed by mutation in the middle gene in both the offsprings. Calculate the fitness values of the new population after two iterations.	[7]
Q6	Consider the search graph given below, where S is the start node and G1, G2, and G3 are goal states. Arcs are labelled with the cost of traversing them and the heuristic cost to a goal is shown inside the nodes. Indicate which of the goal states is reached first with A* algorithm.  Note: Arrange the nodes alphabetically in case nodes have same evaluation function value. Write the contents of OPEN and CLOSED lists at each step.	[7]
Q 7	Discuss the steps and principles on which Simulated Annealing works. Show graphically the effects of the parameters used in this algorithm on the probability distribution?	[7]

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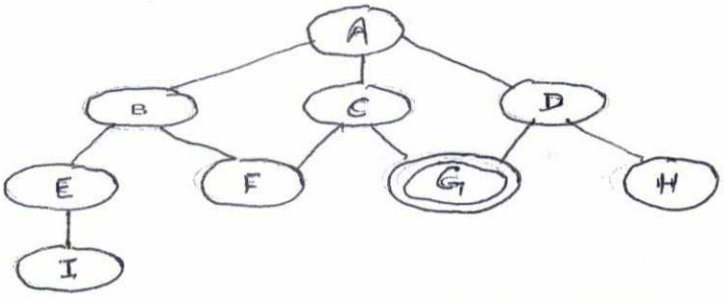
Computer Science and Engineering Department
Thapar Institute of Engineering and Technology
Quiz UCS-411 (Artificial Intelligence)

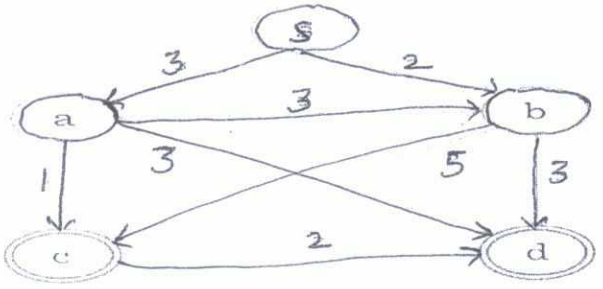
Time: 15 Minutes MM: 15

Note: Overwritten and multiple answers will not be evaluated. Pencils are not allowed. There will be deduction of 25% marks for wrong answers.

Q 1	Agents behavior can be best described by A. Perception Sequence B. Agent Function C. Sensors and Actuators D. Environment in which the agent is working
Q 2	Environment of 8-PUZZLE problem is A. partially observable, deterministic and episodic B. fully-observable, deterministic and episodic C. partially observable, non-deterministic and episodic D. fully-observable, deterministic and sequential
Q 3	Breadth-first search is optimal A. When there is less number of nodes B. When all step costs are equal C. When all step costs are unequal D. None of the mentioned
Q 4	How many successors are generated in backtracking search? A. 1 B. 2 C. 3 D. 4
Q 5	A technique for determining whether a computer could or could not demonstrate the artificial Intelligence is A. Narrow AI B. Expert System C. Super AI D. None of the above
Q 6	Space complexity of Iterative Deepening Depth First Search(b is branching factor and d is depth,^ is for power) is A. O(d) B. O(bd) C. O(b^d) D. None of the mentioned
Q 7	For the given tree,  if the goal node is 'G' and initial node is 'A' and you have found solution using DFS, then in the end, the number of entries in the closed list are A. 6 B. 8 C. 7 D. None of the mentioned

Good Luck

P.T.O

Q 8	In which agent. the problem generator is present? A. Utility based Agent B. Reflex Agent C. Goal based Agent D. Learning Agent
Q 9	What kind of environment is used in the crossword puzzle? A. Dynamic B. Static C. Semi Dynamic D. Continuous
Q10	A* algorithm is based on which of the following? A. Breadth-First-Search B. Depth-First -Search C. Best-First-Search D. Hill climbing
Q11	Which of the following is false? A. Simple reflex agents are not able to handle unseen circumstances B. Model-based agents uses model to make decisions in environments C Utility in Utility-based agents is used for identifying utility of sensors and actuators D. Actions taken by Goal-based agents are goal oriented
Q12	Which of the following is true, if A* algorithm is applied on following Graph (s: source, c,d: Goal node).  h(s) = 1, h(a) = 3, h(b) = 3, h(c) = 0, h(d) = 0 A Node D will have priority over C in queue B. Node a will have priority over b in queue C. Both options (A) and (B) are true D. Both options (A) and (B) are false
Q13	If we have two jugs called Four and Three: Four can store a maximum of four gallons of water and Three a maximum of three gallons of water. The minimum number of steps to fill one gallon of water in the Four jug, if initially both jugs are empty, are A. 8 B. 9 C. 7 D. None of the mentioned
Q14	Which searching algorithm takes less memory A. Breadth First Search B. Depth First Search C. Random Search D. None of the mentioned
Q15	Random Walk in Simulated Annealing happens A. When temperature is very low B. Probability is 0.5 uniformly C. When probability is close to 1. D. None of the mentioned

Good Luck