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MANIPAL INSTITUTE OF TECHNOLOGY

SEVENTH SEMESTER B.Tech.(CSE) DEGREE END SEMESTER EXAMINATION
DEC. 2014
ARTIFICIAL INTELLIGENCE(ELECTIVE-III) (CSE 423)
DATE: 8-12-2014

TIME: 3 HOURS MAX.MARKS: 50

Instructions to Candidates

- Answer **any five** full questions.

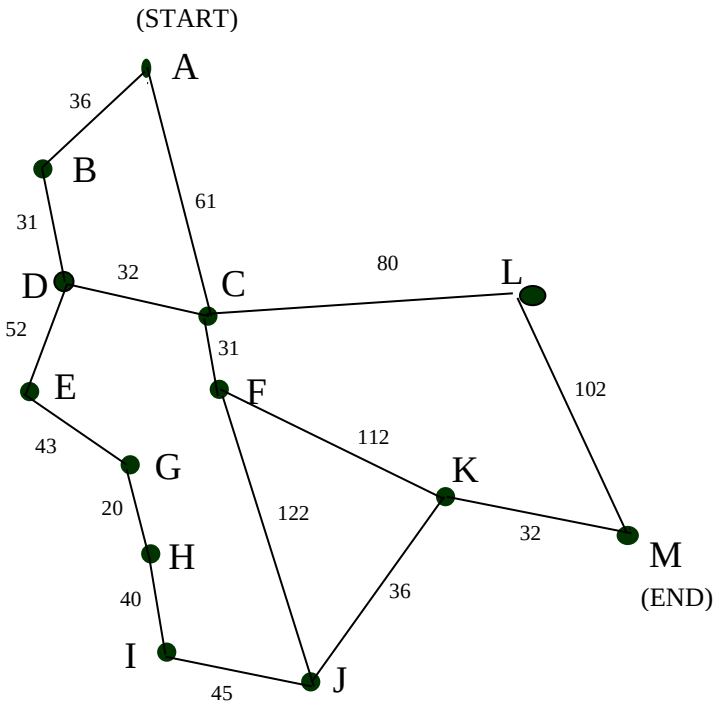
1 A. Give an approach for each of "acting humanly" and "thinking humanly" categories under AI definitions. Based on these human approaches, distinguish rational agent based approaches from human based approaches.
1B. If A is an agent, how do you treat other object B for a single agent and a multi agent environment? Apply the distinction to the car driving environment and explain.
1C. Is it possible for a known environment to be partially observable? Explain by taking an example of card games. (4+3+3)

2A. Is it possible to define the problem so as to eliminate redundant paths? Explain with an example to show that refining the problem leads to better formulation. Work out the number of paths for both original and improved formulation and show the result.
2B. Consider a Depth First Search (DFS) in which all successors are generated at a time. Work out the memory requirements by creating a search tree of depth m = 3 and branching factor b = 2. In this search tree, mark all the nodes that are to be stored during the traversal. Assume that the goal node is the leftmost node at depth 3.
2C. Consider a Breadth First Search (BFS) algorithm with branching factor b = 2, depth of the shallowest goal node is d = 4 and maximum length of any path in the state space is m = 6.

i) How many nodes are generated during BFS to search goal node?
ii) If 100 bytes are needed per node then what is the memory requirement to store nodes generated in (i)
iii) If 1000 nodes can be searched per second, then what is the time requirement for searching nodes generated in (i) (4+ 3+ 3)

3A. For the 8 puzzle problem with initial state {2, 8, 7, 3, 1, 4, 5, 6, 0}, show the search tree that would be built up to level 2 using Iterative Deepening Search (IDS). Furnish the results on a table with following header {Depth number, Number of nodes generated, Number of times generated, Time complexity}. Also, find the total number of nodes generated after the completion of IDS.
3B. Explain the relationship between uniform cost search and A* algorithm. Show that uniform cost search can be treated as a kind of A* algorithm.
3C. Suppose there are two heuristics h1 and h2 with h1 < h2. Further, there are two A* algorithms namely A*(h1) and A*(h2) associated to h1 and h2 respectively. If b1 and b2 are the effective branching factor for A*(h1) and A*(h2) then what is the relationship between b1 and b2? ((3+2)+(1+2)+2)

4A. Using A* algorithm work out a route from town A to town M. Use the following cost functions: g(n) = The cost of each move as the distance between each town (shown on map). h(n) = The Straight Line Distance between any town and town M (shown on table). Provide the search tree showing the order in which the nodes are expanded and the cost at each node. For each node n, display g(n), h(n) and f(n) separately besides each node. Finally, state the route taken and the cost of that route.



A	223
B	222
C	166
D	192

E	165
F	136
G	122
H	111

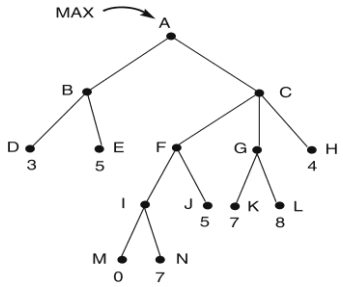
I	100
J	60
K	32
L	102

M	0

4B. Taking a tree of depth 3, explain in what ways a game tree is different from a search tree

4C. The following tree represents all possible outcomes of a hypothetical zero-sum game. Perform minimax on the game tree shown below. Show the assigned utility functions to all states in the search tree. What move should be chosen by A? Comment on time and space complexity of minimax algorithm.

(5+2+3)



5A. Show that A V B, ¬B V C is sound by means of truth table technique.

A V C

5B. Express the following sentences in the first-order logic.

i) No student buys an expensive gift.
ii) If x is a professor of y or x is the supervisor of y then x is the teacher of y.
iii) No student likes a professor unless the professor is smart

5C. Express the initial state and goal state of the planning problem in the blocks world problem for three blocks labelled A, B and C. Consider the start state as the one in which all blocks are stacked continuously one above another such that A is the topmost block and is on top of B. B is on top of C and C is on table. Goal state is the one in which all blocks are stacked continuously one above another such that C is the topmost block and C is on top of B. B is on top of A and A is on table. Make use of predicates involved in blocks world problem only. Explain how frame problem is dealt in blocks world domain.

(2+(1+1+2)+4)

6A. What are semantic networks? Draw a semantic network to illustrate inheritance and show that it helps in drawing inference.

6B. Explaining each of the components, outline the structure of an agent that uses decision theory to select actions.

6C Distinguish between reinforcement learning and supervised learning. (4+3+3)