Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

VII SEMESTER B.TECH. (COMPUTER SCIENCE AND ENGINEERING)
END SEMESTER EXAMINATIONS, NOV/DEC 2016
SUBJECT: ARTIFICIAL INTELLIGENCE (ELECTIVE-III) (CSE 423)
REVISED CREDIT SYSTEM
(6/12/2016)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitable assumed.

1A. Draw the four categories of AI. List the negative features of Turing Test and mark its category in the quadrant. 2

1B. Taking Vacuum-cleaner problem as an example artificial agent, clearly explain an agent function and agent program. Show the tabulation of agent function and the code for the Vacuum-cleaner problem. 3

1C. Outline the environment types to classify a hardest environment and a simple environment. Explain with an example each. 5

2A. What is the difference between a state and a node? Show it with an 8-puzzle example listing all the attributes. 3

2B. In what ways IDS inherits the benefit of DFS and BFS? Explain providing a clear comparison in the table form. Consider the 8 puzzle problem with initial state in a row-major order from top to bottom and left to right order as {2, 8, 7, 3, 1, 4, 5, 6, 0}. Use Iterative Deepening Search (IDS) to show the search tree that would be built up to level 2. 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. 4

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 BFS1 if the goal test is applied to each node when it is generated? If BFS2 applies the goal test to nodes when selected for expansion then what is the time complexity? What is the saving in terms of number of nodes?

ii) If 100 bytes are needed per node then what is the memory requirement to store nodes generated in BFS1?

iii) If 1000 nodes can be searched per second, then what is the time requirement for searching nodes generated in BFS1? 3

3A. Why A* algorithm is treated as an optimally efficient algorithm? Give justification relating optimal cost C* and actual cost f(n) 2

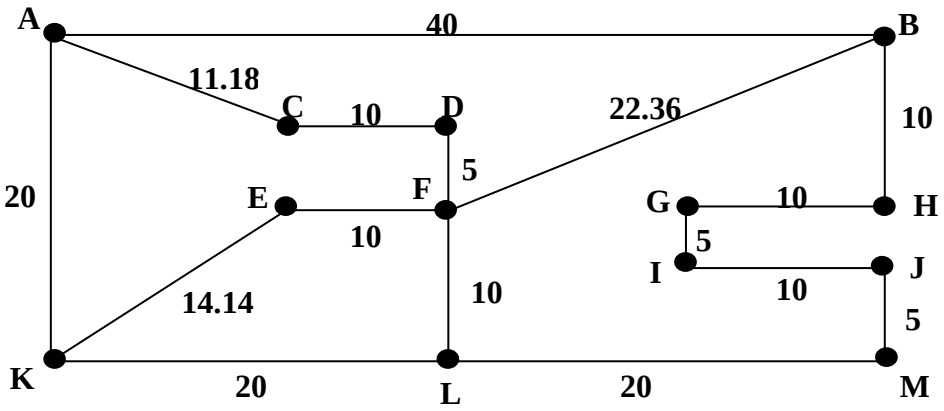
3B. Using the A* algorithm work out a route from town A to town M stating the route taken and cost of that route. The Straight Line Distance between any town and town M is shown in table. Provide the search tree clearly showing the order in which the nodes are expanded and the cost at each node. Comment on the quality of heuristic values based on available parameters. 5

A	44.72
B	20.00
C	33.54
D	25.00

E	31.62
F	22.36
G	14.14
H	10.00

I	11.18
J	5.00
K	40.00
L	20.00

M	0.00



3C. Work out an evaluation of the properties of Greedy Best first search comparing each property with DFS in a table form. What properties of Greedy Best first search do not resemble DFS? Give reason. 3

4A. Comment on the ordering of successors for a MAX node and MIN node to form the best case of alpha-beta pruning algorithm. Justify with an example game tree of depth 2 and branching factor 3. 3

4B. Consider a hypothetical zero-sum game tree where root of the tree denotes a MIN player. The depth of the tree is 2 wherein the branching factor of the root is 4 and branching factor is 2 for each of the successor of the root node. The values of leaf node are in the order {9, -7, 11, 4, -8, -9, -2, 12} from left to right.

i) Draw the game tree to perform minimax and show the assigned utility functions to all states. What move should be chosen by the root node?

ii) Show the game tree by alpha beta pruning algorithm to show the values of alpha and beta at the beginning and at the end of recursive call. Mark alpha and beta values within bracket near each node on the tree and denote it in the form: (α,β).

iii) Show the game tree by alpha beta pruning algorithm to cross each edge that would NOT be considered by the pruning algorithm. 4

4C. Express the following sentences in the first-order logic. Using the generalized laws for double negation of quantifiers express its equivalent meaning in English and first-order logic. "All students buy cell phone. There are some students who buy laptops". 3

5A. Given the premise (PVQ), (¬PVR) of resolution how do you express resolution in implication form? Show soundness of implication form using truth table method. 2

5B. Solve the case using proof by resolution. "If the student holds cellphone during exam, then the student has access to docs. The student had no cellphone and did not have the paper chit, or the student had the paper chit and cellphone. The student had the paper chit". Did the student have access to docs or not? Clearly show all the steps. 3

5C. In first order Logic notations define a planning problem as a search problem by specifying all the components of Air Cargo Transport problem. Also, use Air Cargo problem to distinguish between the forward search and backward search planners. Take Plane = P1, Cargo = C1 and Airport = "MANGALORE" for the initial state and Airport = "BANGALORE" for the goal state. 5

6A. For a neuron j in an artificial neural network, derive a mathematical model to compute the output. Discuss on main types of neural network structure taking internal memory as the basis. 3

6B. Explain the nodes and link types of a semantic network. Use it to construct semantic network for the sentence "Shankar gave Sham the book". Show how properties can be inferred on the basis of category membership by extending above instances using inheritance. 3

6C. What kinds of environment characteristics lead to uncertainty in an agent? Explain with an example of qualification problem of a decision theoretic agent. 4