Ex/CSE/T/415/15/2012

BACHELOR OF COMPUTER SCIENCE ENGINEERING EXAMINATION, 2012

(4th Year, 1st Semester)

ARTIFICIAL INTELLIGENCE

Time : Three Hours Full Marks - 100

Answer any **Five** questions

1. a) What is AI? Discuss on classifications of AI. What is an agent? Compare between goal based agent and utility based agent.

   b) Describe the criteria for evaluating search strategies.

   (3+4+3+5)+5

2. Consider a puzzle where 2N blocks are aligned in a ruler with 2N+1 positions. There are N blue (B) and N white (W) blocks and an empty position. Suppose that the goal is to have all the white blocks positioned to the left of the blue one AND one blue block on the rightmost position. The empty position is not specified.

   Blocks can hop to the empty position when the empty position is at most N cells away. This means that a block can only move half the length of the ruler, not the whole length. Hence, there are at most 2N legal moves.

[Turn over

The cost of Hop (i), i = 1, 2, ..., N is i. There are no circular hops. (i.e., hops wrapping from one end of the ruler to the other). Consider N = 2 and the following initial configuration.

W	B	B	W	–

Use the following rules while answering the questions below :

- Repeated states are detected; and therefore are not represented in the search tree.
- Successor states are expanded in a fixed order : hops of empty position to the left are done before hops to the right ; hops in each direction are done in an increasing order of their cost.

a) Complete the search tree

b) Consider that you are performing Breadth first search, using the above tree. If you are told that the queue contains five nodes, what are the five nodes in it? Use the labels on the node.

c) Consider uniform cost search. If you are told that the priority queue contains three nodes, what is a possibility of what those nodes are?

d) Show all the contents of the queue for all the steps of Iterative deepening using the same tree. 8+4+4+4

c) Given the following :

If the unicorn is mythical, then it is immortal; but if it is not mythical, then it is a mortal mammal. If the unicorn is either immortal or a mammal, then it is horned. The unicorn is magical if it is horned.

i) Translate the above text into formulas of first order logic. Use the predicate symbols Mythical, Mortal, Mammal, Horned and Magical. 4

ii) Convert these formulas into clause form. 4

iii) Is the unicorn magical?

– Prove or disprove using resolution and prove by refutation. 4

7. a) Comment on 'vague concepts are modeled by fuzzy sets'. Model 'bright image' using suitable membership function. 4+2

b) What is fuzzy concentration? Give suitable example. 4

c) What is the necessity of use of non-monotomic reasoning system? Discuss on truth maintenance system. 10

8. Write short notes on : 2x10=20

a) Henristic function and its significance.

b) Bi-directional BFS and island driven search.

3. a) State True or False (Justify) with brief explanation against each.

   i) DLS is guaranteed to find the optimal solution.

   ii) IDA* is guaranteed to find an optimal solution.

   iii) A* cannot search more nodes than Best-first search.

   iv) Graph search algorithm is applicable for a wide variety of search processes. 3+3+3+3

   b) Compare blind search and heuristic search obtain. 5

   c) Obtain the space complexity of ID search algorithm. 3

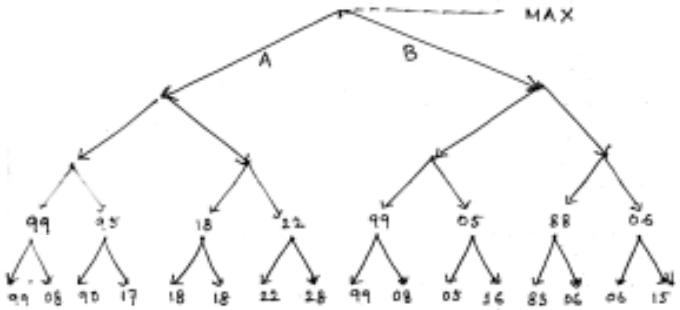
4. a) Illustrate how the operation of an AI production system can be characterised as a search procedure. 6

   b) In the following tree, should MAX choose branch A or B if the depth of the search is 3? Explain. 3

   c) In the following tree, should MAX choose branch A or B if the depth of the search is 4? Explain. 3

   d) Give a reason why the node value numbers in depth 3 and 4 might change as they generally do in the tree above. 3

   e) For the complete tree above, would there be any nodes pressed by the $\alpha-\beta$ search machanism? If yes, show which ones, otherwise explain why not? 5



5. a) Draw the analogy between process of solving an optimisation problem using simulated annealing (SA) and physical annealing procedure. When will SA behave like hill climbing? 6+2

   b) "In Genetic Algorithm crossoner is treated as primary operator and mutation as secondary one." – Justify. 5

   c) How the resolution of a solution is controlled in GA? 3

   d) Write down the distinguishing characteristics of GAs? 4

6. a) Justify – 'Resolution is a sound rule of inference'. 4

   b) Represent the following sentences by predicate calculus wffs.

   i) If two persons fight over a third one's property, then the third one gains. 2

   ii) No automobile that is over ten years old will be repaired if it is severely damaged. 2