

BACHELOR OF COMPUTER SCIENCE ENGINEERING
EXAMINATION, 2011

(4th Year, 1st Semester)

ARTIFICIAL INTELLIGENCE

Time : Three Hours

Full Marks - 100

Answer any **five** questions

1. a) What is 'AI'? Can a computer think? What conclusions can be made from 'Turing test' in connection to the intelligence of a machine? 3+3+4
 b) What is an agent? Write down the differences between 'Rule based Reflex Agent' and 'Reactive and Memory Agent'. 2+3
 c) Discuss on performance measuring indices to evaluate any search strategy. 5

2. a) What is 'State Space Graph'? What is an 'Implicit Search Graph'? When do we make this 'Implicit Graph' into 'Explicit' one? 3+3+2
 b) Compare the BFS, DFS and IDS with respect to computation time requirement. 4
 c) State at least two reasons to justify that 'IDS is an optimal search algorithm with respect to space consumption.' 4
 d) To carry out 'Island-driven search' what do we expect as input? When will the maximum reduction of search time occur for this search technique? 2+2

[Turn over

3. a) Compare and contrast blind search and heuristic search. 5
b) Consider the following problem :

Description : You are on the beginning of a woobly bridge with Mr. Wolf, Mr. Goat and Mr. Cabbage. It is dark, and the group has only one flashlight. Your task is to get everyone to the other side, with the following restrictions.

Restrictions :

1. At most two people can be on the bridge at the same time.
2. People need the flashlight to cross the bridge.

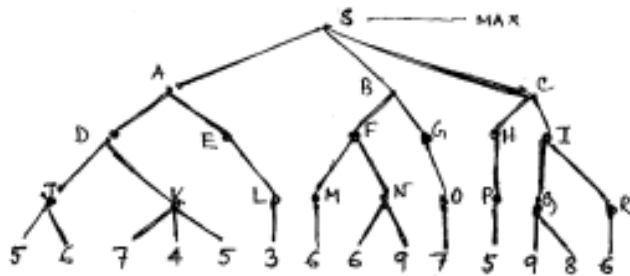
The cost is :

You can cross the bridge in 1 minute, Mr. Wolf needs 2 minutes, Mr. Goat needs 5 minutes and Mr. Cabbage needs 10 minutes. If two people cross the bridge together, they need as much time as the slowest of them.

- Formulate the above problem in terms of state space search.
- Solve this problem by drawing the search tree, and finding the shortest path to the goal states. Limit the size of the search by disallowing moves that revisit past states. What is the cost of the optimal solution?
- Which search process will be best suitable to solve this problem? Discuss. 15

7. a) Represent the following sentences using predicate calculus wffs. 3+3+4
1) There is a barbar who likes all men who do not share themselves.
2) Every city has a dogcatcher who has been bitten by every dog in the city.
3) All boxes on the top of the boxes that have been shifted or that are attached to the boxes that have been shifted also been shifted.
- b) Why the system capable of handling real-life situation cannot be considered as monotonic one. Cite some example. 5
- c) Compare between SL-justification and CP-justification. What is dependency directed backtracking? 3+2
8. Write short notes on :
a) Control strategies for Resolution Reputation
b) AI production system. 10+10

- e) Consider the following game tree in which static scores are all from first player's point of view. Which branches will be pruned if algorithm is used? 5



6. a) Find the mgu of the followings :
 $\{p(f(x), y, g(y)), p(f(x), z, g(x))\}$ 4
- b) What is skolem constant? Where is it used? 3
- c) Why Resolution Refutation process is said to be complete? 3
- d) Assume the following facts :
 Every boy or girl is a child.
 Every child gets a doll or a train or a lump of coal.
 No boy gets any doll.
 No child who is good gets any lump of coal.
 Jack is a boy. 10
 Use resolution to prove "If Jack does not get a train, then Jack is not a good boy".

4. a) If you use an admissible heuristic, are the search space visited by hill climbing and best first search the same? If yes, why? If no, justify or give an illustrative counter example. 4
- b) How do you say that A* algorithm uses both past and future? 4
- c) What happens when the temperature is cooled too quickly in simulated Annealing? What about too slowly? Discuss on 'cooling schedule' of Simulated Annealing'. 6
- d) In GA, why the 'crossover' is called a 'primary' operator and 'mutation' the 'secondary' one? What will happen if we exchange the two? 6
5. a) Compare and contrast Minimax algorithm with ' α - β pruning' search algorithm. 5
- b) How do we view a 2-person perfect information game tree as an AND-OR tree? Which nodes are designated as 'AND' nodes and which are 'OR' nodes in such tree? 5
- c) What is horizon effect? 2
- d) Define α -cut off and β -cut off. 3