**COMP 3710 Artificial Intelligence**

Fall 2016

Term test I

Student Name: Student Number:

1. (2 marks) Define what an admissible heuristic is.
2. (6 marks) Answer questions the Missionaries and Cannibals problem.
3. Design a suitable representation of problem state, with brief explanation.
4. Give the initial state and the goal state, using the formal representation that you design in a).
5. Give all the possible next states after the initial state.
6. (4 marks) You are solving a TSP with 10 cities.
7. Decide the representation of individuals with brief explanation.
8. Explain how to evaluate each individual.
9. (6 marks) You are solving the 8-puzzle game using the A\* algorithm with the Manhattan distance heuristic.

* Representation: numbers in the first row, numbers in the 2nd row, numbers in the 3rd row.

E.g., The initial node is (283, 164, 705)

|  |  |  |
| --- | --- | --- |
| 2 | 8 | 3 |
| 1 | 6 | 4 |
| 7 |  | 5 |

* The goal is (123, 456, 780).

|  |  |  |
| --- | --- | --- |
| 1 | 2 | 3 |
| 4 | 5 | 6 |
| 7 | 8 |  |

* The queue for visited nodes, visitedQ, has {(283, 164, 705)}
* The queue for expanded nodes, expandedQ, has

(283, 104, 765), g=1

(283, 164, 075), g=1

(283, 164, 750), g=1

1. Decide the h-values (heuristic values) for the above three nodes in expandedQ.
2. Decide the next node to visit with brief explanation, and decide the updated visitedQ.
3. Decide the updated expandedQ, with g-values and h-values.
4. (3 marks) We would like to solve the 5-queens problem using Most-Constrained Variable First heuristic.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Q |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Q |  |  |  |  |
|  |  |  |  |  |

a b c d e

Decide the next variable and explain briefly why the variable is chosen.