CMPT 310 Sample Midterm
Summer 2019

Last name *exactly as it appears on student card*									
First name *exactly as it appears on student card*									
SFU Student #									
SFU email *ends with* `sfu.ca`									

This is a **closed book exam**: notes, books, computers, calculators, electronic devices, etc. are **not permitted**. Do not speak to any other students during their exam or look at their work. If you have a question, please remain seated and raise your hand and a proctor will come to you.

	Out of	***Your Mark***
Agent Architecture	9	
Search	13	
Constraint Satisfaction	10	
Short Answer	10	
Total	42	

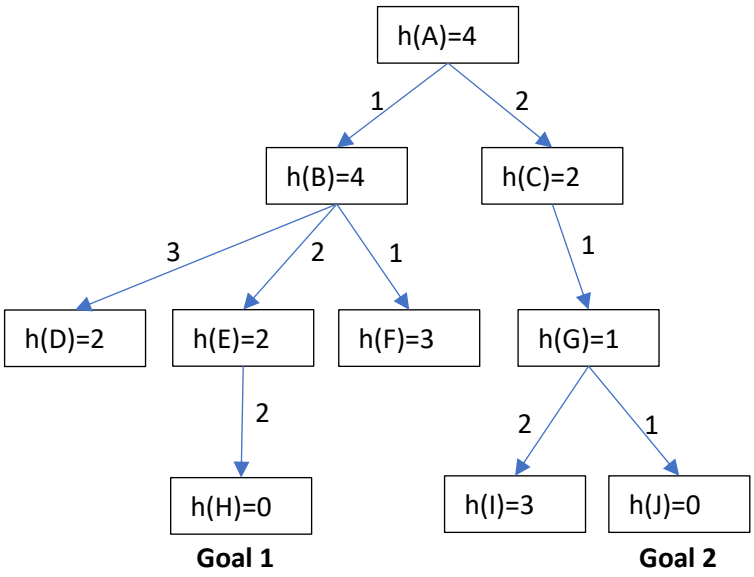
Agent Architecture

a) (2 marks) Give the definition **percept**, along with an example of two different ones.

b) (2 marks) Give the definition of **percept sequence**.

c) (5 marks) What is a **simple reflex agent**, and how does it work? What is one **good** thing about such an agent? What are two different **bad** things about it?

Searching



In the tree on the left, the capital letter in each node is the node's name, and the number is the h-value for that node. Altogether, the h-values define a heuristic function h.

Each edge of the tree is labelled with its cost, and the two goal nodes, H and J, are marked.

For example, node J has an h-value of 0, and the cost of going from node C to node G is 1.

A node is **visited** when it is removed from the frontier. **If there is a tie** about what node to visit next, always choose the node that comes first alphabetically.

a) (3 marks) What are the values of g(H), g(I), and g(J), where g is the regular g-function as defined in A*-search and related algorithms.

b) (2 marks) If you start at node A, in what order will the nodes be visited by **uniform-cost search**?

c) (2 marks) If you start at node A, in what order will the nodes be visited by **greedy best-first search**?

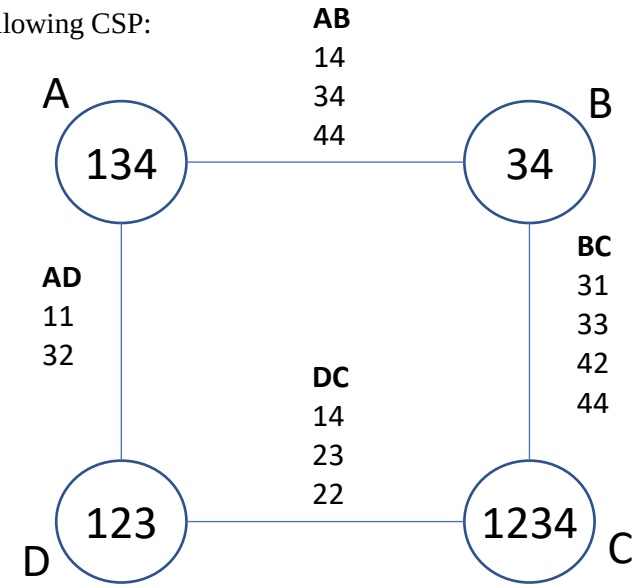
d) (2 marks) Is the heuristic function h **admissible**? If not, why not?

e) (2 marks) What are f(H) and f(I), where f is the f-value function as defined in A*-search?

f) (2 marks) If you start at node A, in what order will the nodes be visited by **A* search**?

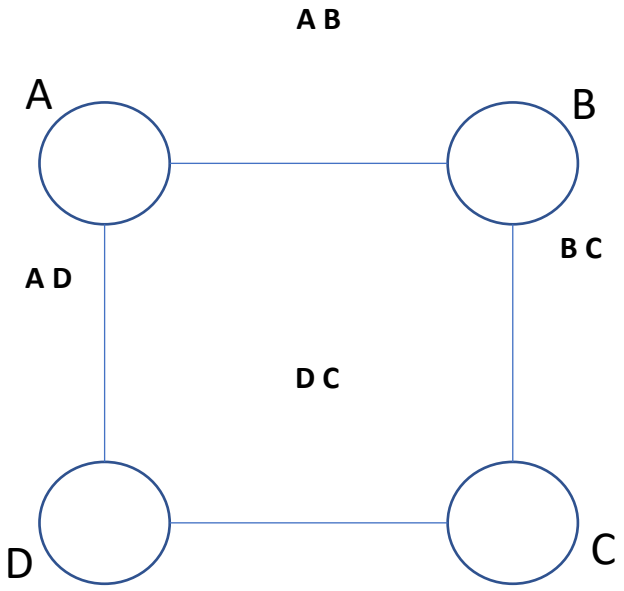
Constraint Satisfaction

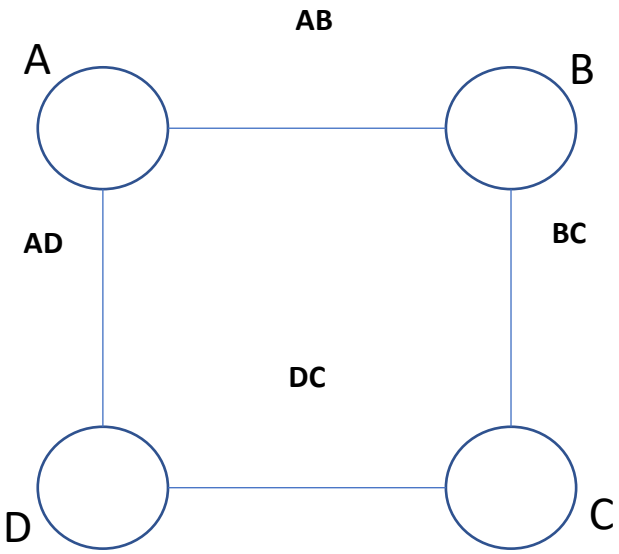
(8 marks) Consider the following CSP:



a) (1 mark) What is the size of the search space of the above CSP?

b) (8 marks) Create an **arc consistent** version of the above CSP. Fill in the domains (in the circles) and constraints (under the corresponding letter pairs) here:





c) (1 mark) What is the size of the search space of the arc consistent CSP in b)?

Short Answer

a) (1 mark) *True* or *False*: AlphaZero uses **alpha-beta search** as it is main search algorithm when playing chess.	
b) (1 mark) *True* or *False*: One of the interesting things about AlphaZero is that it can be used to create world-class players for some games other than chess.	
c) (1 mark) *True* or *False*: AlphaZero learned to play chess by playing games against other very strong chess programs (such as StockFish).	
d) (1 mark) *True* or *False*: Genetic algorithms can be described as a variant of stochastic beam search.	
e) (1 mark) *True* or *False*: If an A*-search heuristic is **consistent**, then it is also **admissible**.	
f) (1 mark) *True* or *False*: If you run the AC3 algorithm on an arc consistent CSP, then the CSP will *not* be changed.	
g) (1 mark) *True* or *False*: In CSP backtracking search, one very popular way of choosing the next variable to assign is to pick the variable with the largest domain.	
h) (1 mark) *True* or *False*: The **min-conflicts** CSP algorithm assigns variables one at a time.	
i) (1 mark) *True* or *False*: The **min-conflicts** algorithm for solving CSPs is an example of a **local search** algorithm.	
j) (1 mark) *Absolutely* or *No Way*: Only humans can be truly intelligent.	