CS171, Intro to AI **Fall 2016 Quiz # 1** **Time: 20 minutes**

Name:_____

ID #:_____ **Seat (Row, #):**_____

Problem 1: (36 points; 3 points each)

For each of the following terms on the left, write in the letter corresponding to the best answer or the correct definition on the right. The first one is done for you as an example.

A	Agent	A	Perceives environment by sensors, acts by actuators
	Percept	B	All states reachable from the initial state by a sequence of actions
	Performance Measure	C	Guaranteed to find a solution if one is accessible
	Rational Agent	D	Set of all leaf nodes available for expansion at any given time
	State Space	E	Maximum number of successors of any node
	Path	F	Guaranteed to find lowest cost among all accessible solutions
	Optimal Search	G	Sequence of states connected by a sequence of actions
	Complete Search	H	Agent's perceptual inputs at any given instant
	Expand a state	I	Agent that acts to maximize its expected performance measure
	Frontier	J	Apply each legal action to a state, generating a new set of states
	Search Strategy	K	Estimates cost of cheapest path from current state to goal state
	Branching Factor	L	How a search algorithm chooses which node to expand next
	Heuristic Function	M	Evaluates any given sequence of environment states for utility

Problem 2: (16 points; 4 points each)

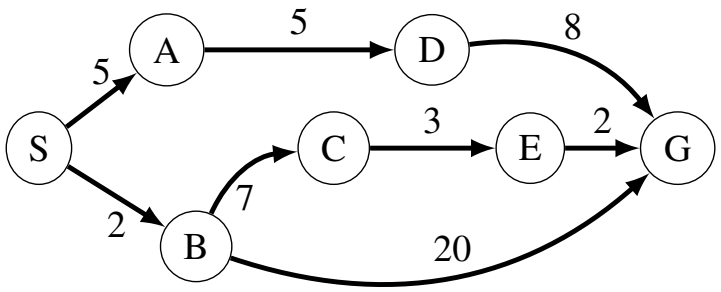
Mark the following statements as True (T) or False (F).

	Breadth-first tree search is complete for the 8-Puzzle problem (as defined in class or textbook)
	Breadth-first tree search is optimal for the 8-Puzzle problem
	Depth-first tree search is complete for the 8-Puzzle problem
	Depth-first tree search is optimal for the 8-Puzzle problem

Problem 2: (48 points; 12 points each)

Execute "Tree Search" through this graph (i.e., do not remember visited nodes). Step costs are given next to each arc. Heuristic values are given in the table (as $h(n) = X$). The successors of each node are indicated by the arrows out of that node. Successors are returned in left-to-right (equivalent: alphabetical) order.

For each search strategy below, show the order in which nodes are expanded (i.e., to expand a node means that its children are generated), from start node S and ending with the goal node (G) that is found. Show the path from start to goal, or write "None". Give the cost of the path found. The first is done for you as an example.



$h(S) = 12$
$h(A) = 8$
$h(B) = 12$
$h(C) = 3$
$h(D) = 7$
$h(E) = 1$
$h(G) = 0$

Depth-first search

Order of node expansion: **S A D G**

Path found: **S A D G** Cost of path found: **18**

Uniform cost search

Order of node expansion: _____

Path found: _____ Cost of path found: _____

Greedy (best-first) search

Order of node expansion: _____

Path found: _____ Cost of path found: _____

Iterative deepening search

Order of node expansion: _____

Path found: _____ Cost of path found: _____

A* search

Order of node expansion: _____

Path found: _____ Cost of path found: _____