

CS-171, Intro to A.I., Fall Quarter, 2012 — Quiz # 1 — 20 minutes

1. NAME: _____

YOUR ID: _____ ID TO RIGHT: _____ ROW: _____ NO. FROM RIGHT: _____

2. (16 pts total, 4 pts each) Your book defines a task environment as a set of four things, with the acronym PEAS. Fill in the blanks with the names of the PEAS components.

Performance (measure) Environment Actuators Sensors

3. (24 pts total, 4 pts each) Label the following statements as True (T) or False (F).

3.a. T Local search algorithms generally operate only on one (or a few) current node(s).

3.b. F Local search algorithms generally are used to find the globally optimal solution.

3.c. T In tabu search recently visited states are temporarily excluded from being visited again.

3.d. F Simulated annealing is more likely to accept a bad move late in the search than earlier.

3.e. T Local beam search retains the k best successors of the k states in the previous step.

3.f. T Hill-climbing moves to the best successor of the current state.

4. (10 pts total, 5 pts each, -1 for each wrong answer, but not negative) You are performing genetic algorithm search for the 8-queens problem. Perform cross-over on these pairs of chromosomes at the indicated points.

4.a.

3	2	7	5	2	4	1	1
2	4	7	4	8	5	5	2



3	2	7	4	8	5	5	2
2	4	7	5	2	4	1	1

Your answer is right if your two vectors have the right numbers. It doesn't matter which vector is on top or on bottom.

4.b.

3	2	7	5	2	4	1	1
2	4	4	1	5	1	2	4



3	2	7	5	2	1	2	4
2	4	4	1	5	4	1	1

5. (50 pts total, 10 pts each)

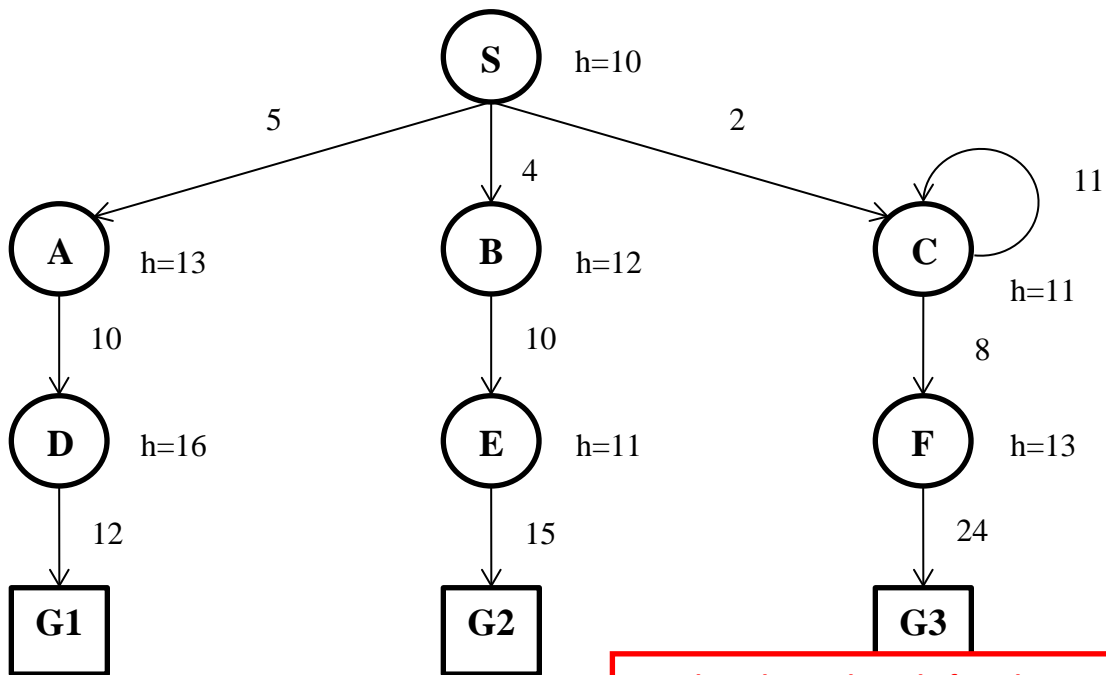
visited nodes, so repeated nodes are not allowed.

Step costs are given on the edges.

$h(x)$. The successors of each node are indicated by the arrows out of that node. Successors are returned in left-to-right order. (Note: C is a successor of itself).

For each search strategy below, indicate the order in which nodes are expanded (i.e., to expand a node means that its children are generated), ending with the goal node that is found.

The first one is done for you as an example.



Please see the lecture slides for Uninformed Search, topic "When to do Goal-Test? When generated? When popped?" for clarification about exactly what to do in practical cases.

Remember how that node (as

5.a. DEPTH FIRST SEARCH.

S A D G1

See Section 3.4.3 and Fig. 3.17.

DFS does the Goal-test before the child is pushed onto the queue. The goal is found when D is expanded.

5.b. (10 pts, -3 for each wrong answer, but not negative) UNIFORM COST SEARCH.

S C B A F C E D F C G1

See Section 3.4.2 and Fig. 3.14.

UCS does goaltest when node is popped off queue.

5.c. (10 pts, -3 for each wrong answer, but not negative) GREEDY (BEST-FIRST) SEARCH.

S C C C C C C C C C etc.

See Section 3.5.1 and Fig. 3.23.

C always has lower h ($=11$) than any other node on queue.

5.d. (10 pts, -3 for each wrong answer, but not negative) ITERATED DEPTH SEARCH.

S S A B C S A D G1

See Sections 3.4.4-5 and Figs. 3.18-19.

IDS does the Goal-test before the child is pushed onto the queue. The goal is found when D is expanded.

5.e. (10 pts, -3 for each wrong answer, but not negative) A* SEARCH.

S C B A F C E G2

See Section 3.5.2 and Figs. 3.24-25.

A* does goaltest when node is popped off queue.

5.f. (10 pts, -3 for each wrong answer, but not negative) OPTIMALITY.

Did Uniform Cost Search find the optimal goal? Yes Why or why not? Step costs are $\geq \epsilon > 0$

Did A* Search find the optimal goal? No Why or why not? heuristic is not admissible (at D)

OK to say "Heuristic overestimated" or "Heuristic is too high."

5.e. A* SEARCH. Represent nodes as state/h/g/f.

Initial Queue: (S/10/0/10)_____.

Popped Node: (S/10/0/10)_____.

Children (left-to-right): (A/13/5/18) (B/12/4/16) (C/11/2/13)_____.

Queue (sorted): (C/11/2/13) (B/12/4/16) (A/13/5/18)_____.

Popped Node: (C/11/2/13)_____.

Children: (C/11/13/24) (F/13/10/23)_____.

Queue: (B/12/4/16) (A/13/5/18) (F/13/10/23) (C/11/13/24)_____.

Popped Node: (B/12/4/16)_____.

Children: (E/11/14/25)_____.

Queue : (A/13/5/18) (F/13/10/23) (C/11/13/24) (E/11/14/25)_____.

Popped Node: (A/13/5/18)_____.

Children: (D/16/15/31)_____.

Queue: (F/13/10/23) (C/11/13/24) (E/11/14/25) (D/16/15/31)_____.

Popped Node: (F/13/10/23)_____.

Children: (G3/0/34/34)_____.

Queue : (C/11/13/24) (E/11/14/25) (D/16/15/31) (G3/0/34/34)_____.

Popped Node: (C/11/13/24)_____.

Children: (C/11/24/35) (F/13/21/34)_____.

Queue : (E/11/14/25) (D/16/15/31) (G3/0/34/34) (F/13/21/34) (C/11/24/35)_____.

Popped Node: (E/11/14/25)_____.

Children: (G2/0/29/29)_____.

Queue : (G2/0/29/29) (D/16/15/31) (G3/0/34/34) (F/13/21/34) (C/11/24/35)_____.

Popped Node: (G2/0/29/29)_____.

Children: Goal test succeeds._____.