

CS 404 – Artificial Intelligence Spring 2019

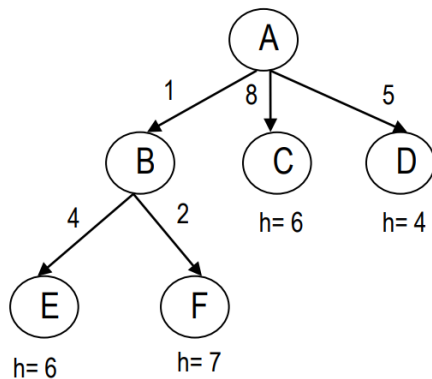
HW3-Local Search – Adversarial Search

75pts

- 1) **5pts** – Give the name of the algorithm that results when you do a local beam search with $k = 1$.

Answer: **Hill-climb search**

- 2) **30pts** – Consider the following **partial** search tree (we are in the middle of the search), where each edge is labeled with the cost of the corresponding operator and the leaves (fringe nodes) are labeled with the value of a heuristic function, h , estimating the remaining cost to the goal. Which node will be expanded next by each of the following search methods? Give a very small explanation or show your work.



1. Uniform-Cost Search: **F** => We only look edges at each step so, we will explore **F**
2. Greedy Best-First Search: **D** => We only look at heuristics so, we will explore **D**
3. A* Search: **D** => We will look both at heuristic and edge cost so, we will explore **D**

- 3) **10pts** A heuristic results in exploring $N=180$ nodes and finds the solution at depth $d=2$. What is its effective branching factor? Give an **approximate** answer, but you must show your work.

$$180 = 1 + b + b^2$$
$$b = 13$$

Hint:

$$9^3 \sim 720$$

$$10^3 = 1000$$

$$11^3 \sim 1300$$

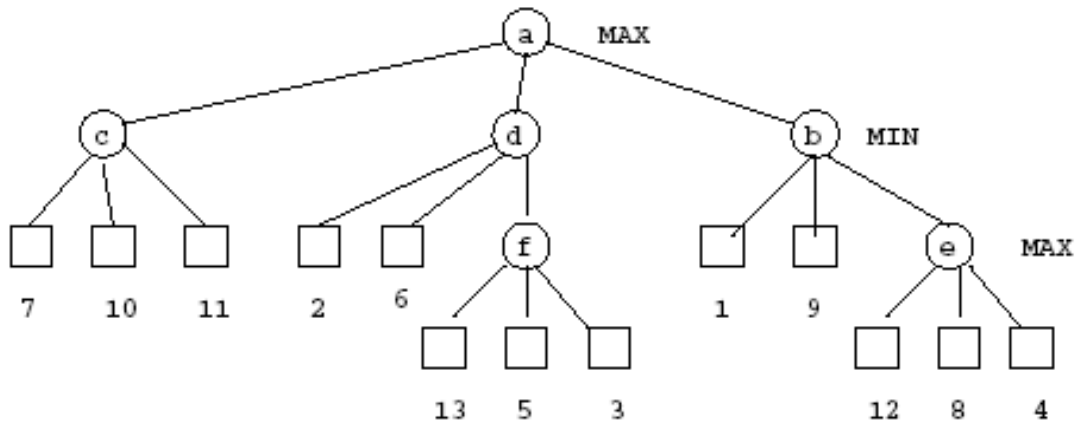
$$12^3 \sim 1800$$

$$13^3 \sim 2200$$

$$14^3 \sim 2750$$

4) 30pts - Game Playing

Using the following Minimax tree, answer the following questions:



a) 5pt - What score is guaranteed for MAX?

Answer: 7

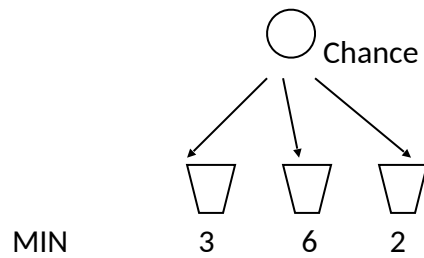
b) 15pt - Indicate **all the nodes** that are pruned using alpha-beta pruning? You can use the node name or values to indicate.

Answer: f, e, 6, 9

c) 5 - True or False: If Max uses alpha-beta pruning in Minimax, can s/he miss the chance of a better play (if s/he didn't prune)? Assume a perfect opponent.

Answer: true

d) 5pt - What is the expectimax value for the following chance node (circle)? Assume equal probability for each of the chance outcome and the given expectimax values for the MIN node.



expectimax = 11/3

*) For those who have requested extra study questions, other good questions to work on (from the topics we covered) are: AIMA 3rd ed: 4.9 (topic not covered, but in the slides) 5.12, 5.15, 5.18, 5.19, 5.21,