**CS 404 – Artificial Intelligence**

**Spring 2019**

**HW3–Local Search – Adversarial Search**

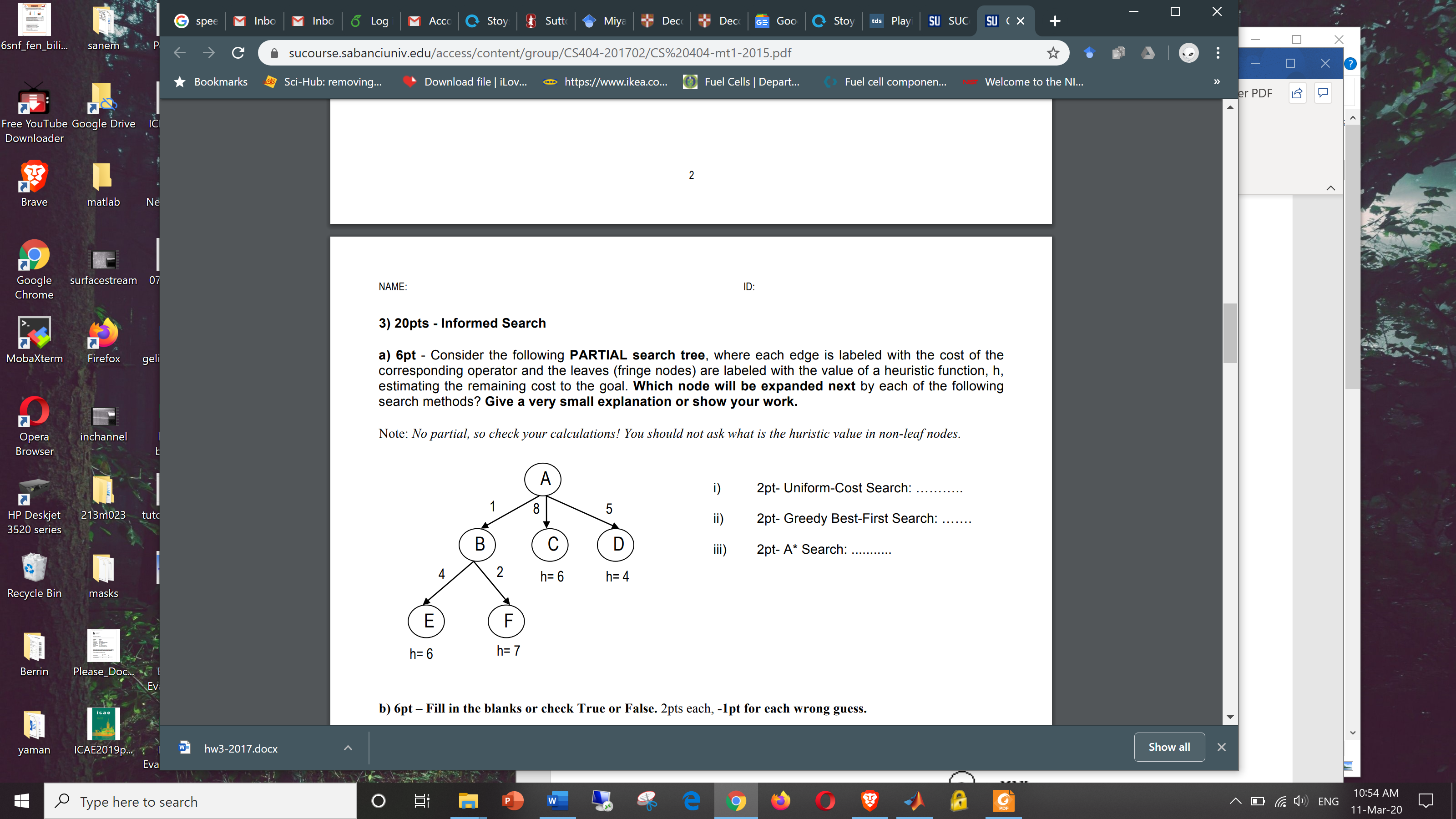
75pts

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

k = 1.

**Answer:** **Hill Climbing Search**

1. **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…(it chooses which cost of the path is optimal so F(3))**
2. Greedy Best-First Search: .**D. (greedy best first search uses heuristic function and choose actions that seems to bring the biggest gain at each step of the algorithm which is h = 4.)**
3. A\* Search: ...D........ (Evaluation function is combination of both g(n) which is path cost h(n) which is heuristic. So the best option is D ( 5 + 4)
4. **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 = 1 + b\* + (b\*)^2**

**180 = b\* + (b\*)^2**

**b *~* 13 — > 13 + 13^2 = 182**

**So, effective branching factor is 13**

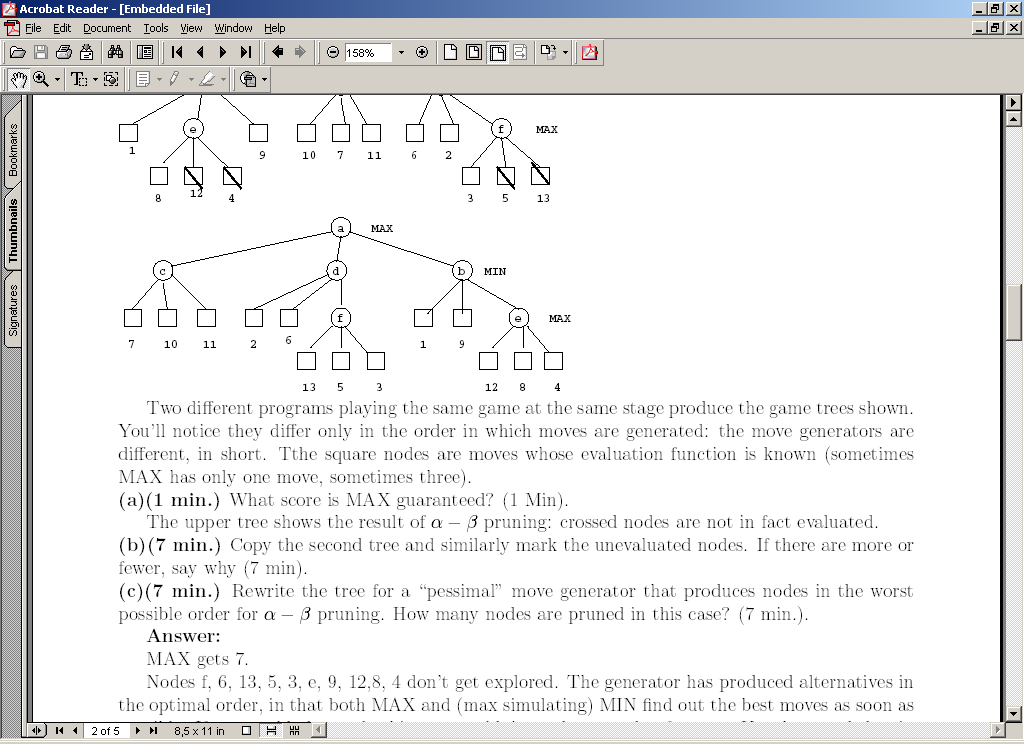
**Hint:**

**A close up of a sign

Description automatically generated**

1. **30pts - Game Playing**

Using the following Minimax tree, answer the following questions:



1. 5pt - What score is guaranteed for MAX?

**Answer: 7**

1. 15pt - Indicate **all the nodes** that are pruned using alpha-beta pruning? You can use the node name or values to indicate.

**Answer: Node with value 6, F node and it’s children, node with value 9, E node and it’s children**

1. 5 - True or False: If miss the chance of a better play (if s/he did’t prune)? Assume a perfect opponent.

**Answer: No he will not miss cause alpha-beta pruning does not affect the best solution.**

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.

Chance = average : 3 + 6 + 2 / 3 = 11 / 3 = 3.6

MIN 3 6 2

\*) 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,