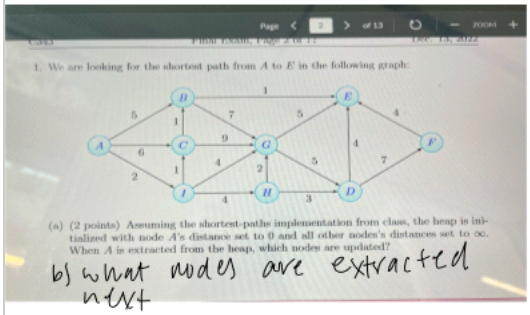
Final Exam Review 343

Monday, December 11, 2023 7:34 PM

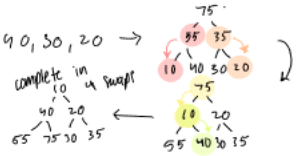
343 exam notes



b) what nodes are extracted next

Shortest Path:
a) all nodes connected are updated: D, C, I
b) I, C, B, E, explore lowest cumulative cost
c) Can you find shortest path w/o exploring all nodes? yes, G, H, D, F are never explored

heap from array: 75, 55, 35, 10, 40, 30, 20 →

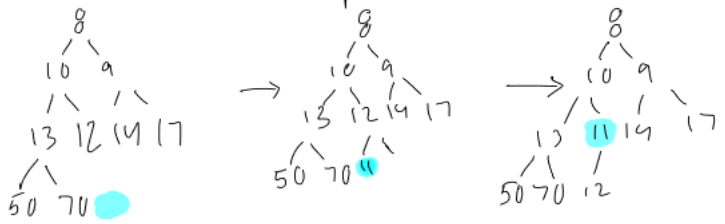


Binary heaps:
a) given a node at index 73, what are the indices of all ancestors til root a Q.

to find parent indices: $(i-1)/2$

parent = $73-1/2 = 36$
gparent = $35/2 = 17$
ggparent = $16/2 = 8$
gggparent = $7/2 = 3$
g^4parent = $2/2 = 1$
g^5parent = $0/2 = 0$ = root.

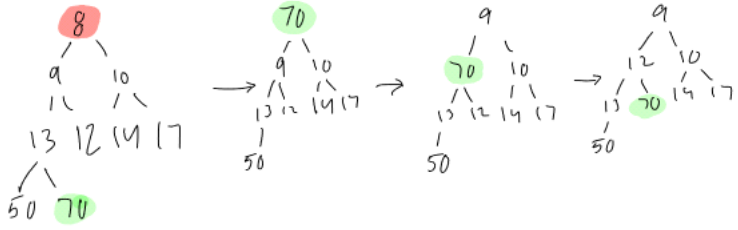
b) add 11 to heap



move up: if parent is > child swap, and recursively call on child

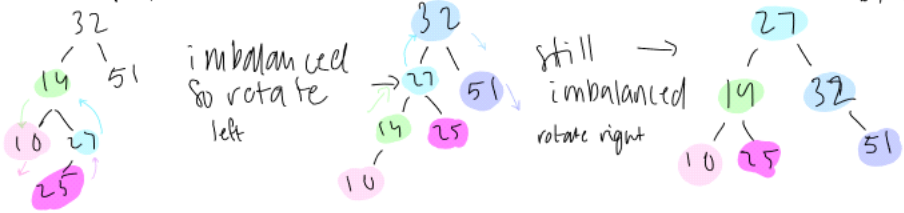
move down: if parent is > child, swap down and recursive call, parent

c) extract min:



replace min node with last(70) and move it down until heap prop. is there. Swap with smaller value.

AVL Tree:
insert 25 into tree



So, left. right rotation

find first common ancestor of 27 and 50

$50 = 49/2 = 24 = 23/2 = 11 \sim 10/2 = 5 \sim 5/2 = 2$

$27 = 26/2 = 13 = 12/2 = 6 = 5/2 = 2$

common ancestor: 2

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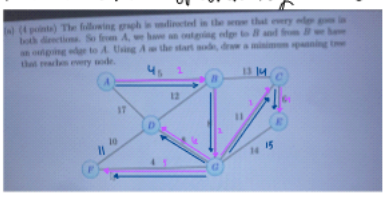
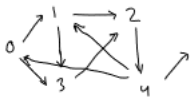
Minimum spanning tree:



min spanning tree weight: 42 - version a

min spanning tree weight: 41 - version b.

DFS and BFS



DFS order: 0, 1, 2, 4, 5, 3

BFS order: 0, 1, 3, 2, 4, 5

Topological sorting:

given a list of enter and exit actions: first exit to last exit

exit 3, exit 6, exit 4, exit 2, exit 5, exit 1 → [3, 2, 6, 5, 4, 1]

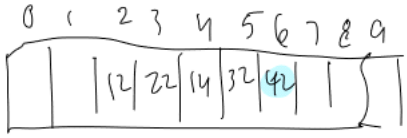
aka: go backwards from end nodes

Hash Tables:

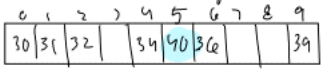
hash = x % 10

insert (12, 14, 22, 32, 42)

linear probing



quadratic probing:



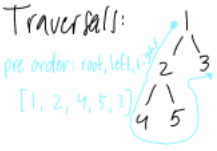
insert (34, 30, 39, 36, 32, 31, 40) i = number of attempts

quadratic: (hash + i^2) %

40 % 10 = 0 (0+1)% = 1 (0+4)% = 4 (0+9)% = 9

(0+16)% = 6 (0+25)% = 5

Traversals:



pre order: root, left, right

[1, 2, 4, 5, 3]

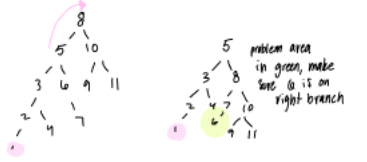
post order: Left, Right, Root

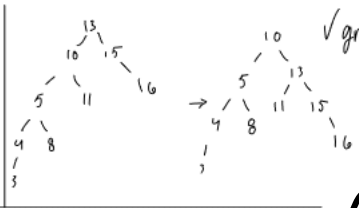
[4, 5, 2, 3, 1]

in order: left, root, right

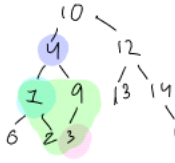
[4, 2, 5, 1, 3]

More AVL trees

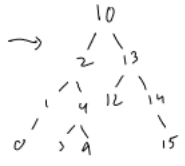




✓ great



problem area here, make sure that children of 9 are still greater than children of left tree.



3 is not greater than 4, has to go in left