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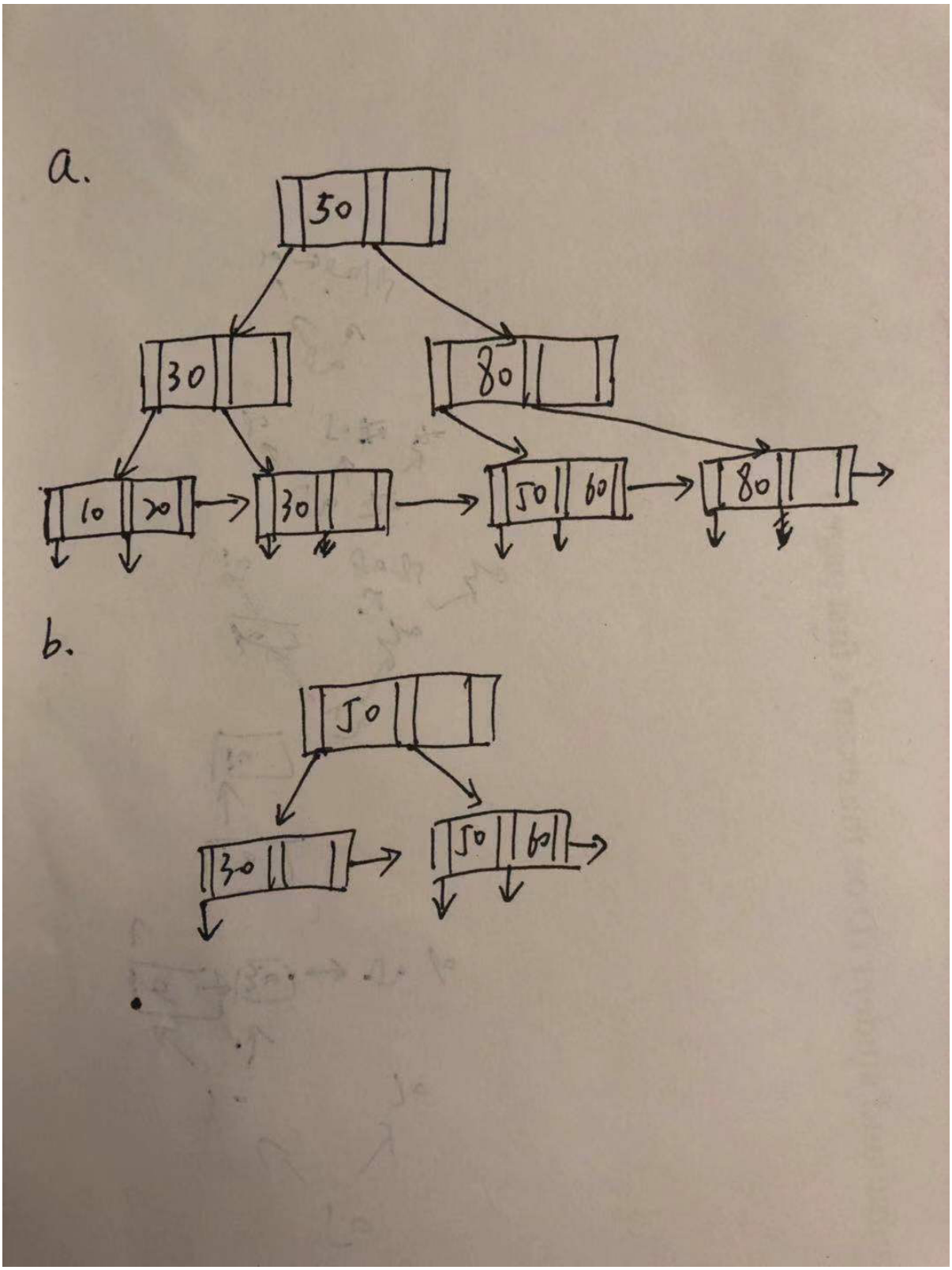
CS 143
HW 4

1.



2.

Minimum Height:

We want as many nodes as possible in every level which is 5-1= 4

Level 1: 4 4

Level 2: 5x4 20

Level 3: 5x5x4 100

Level 4: 5x5x5x4 500

The min height is 4.

Maximum Height:

We want as less nodes as possible in every level

The min number of nodes we can have is ceil((5-1)/2) = 2

Level 1: 2 2

Level 2: 3*2 6

Level 3: 3*3*2 18

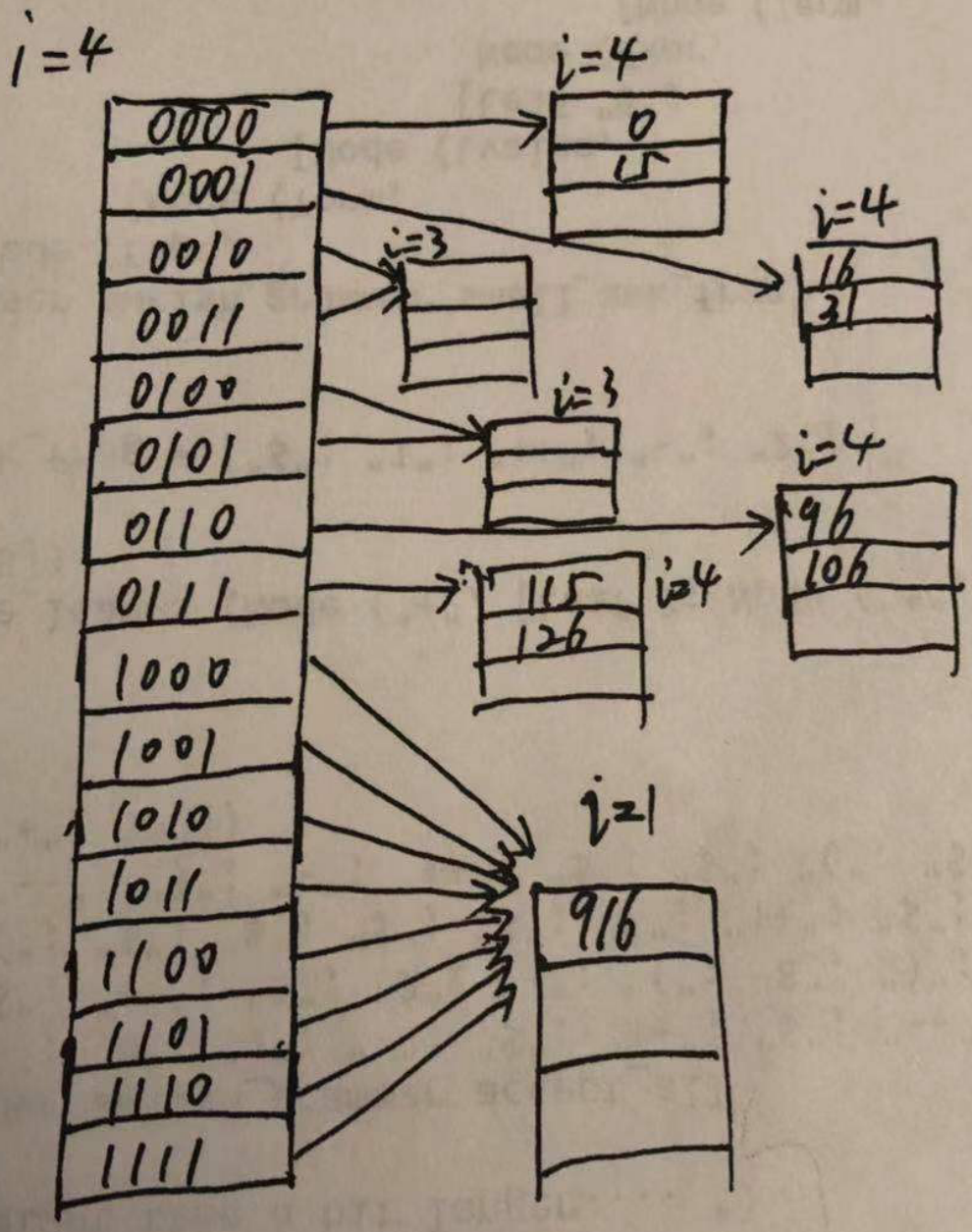
Level 4: 54

Level 5: 162

Level 6: 486

The max height is 6.

3.


i=4
0000
0001
0010
0011
0100
0101
0110
0111
1000
1001
1010
1011
1100
1101
1110
1111
i=4
0
15
i=3
i=4
16
31
i=3
i=4
96
106
115
126
i=4
i=1
916

4.
(1).
R : 100
S : 100
(2).
10n+10(n-1) < 1000
max possible value is 50
(3).
a.
Since the max n for a B+ tree is 50, then the min number of keys per node is ceil((50-1/2)) = 25. So the number of leaf node is 500/25 = 20 and the number of root node is one. The total is 21.
b.
Read S : 100 disk I/Os
Write B+ trees: 21 disk I/Os
121 in total
(4).
Total disk I/Os for block nested loop join: 100 + 4*100 = 500.
If we construct an index for S.B, then the I/O will be 242
It worths.