

Algorithms

이건

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1.

- a) X
- b) X
- c) O
- d) X
- e) X

2. $T(n) = 2T(n/2) + n^3$

n^3

$n^3/8$
 $n^3/64$
 $n^3/64$

$n^3/8$
 $n^3/64$
 $n^3/64$

$- n^3$

$- n^3/4$

$- n^3/16$

$= n^3 + n^3/4 + n^3/16 + \dots$

$= n^3(1 + \frac{1}{4} + \frac{1}{16} + \dots)$

$O(n^3)$

$$\begin{aligned} T(n) &= 2k(n/2)^3 + n^3 \\ &= n^3(\frac{k}{4} + 1) \\ &= n^3(k - \frac{k}{4} + 1) \end{aligned}$$

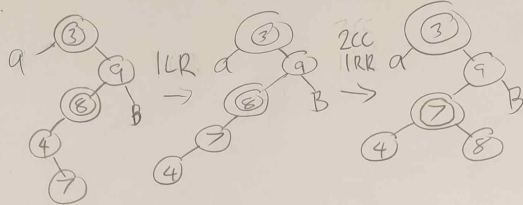
$$\begin{aligned} kn^3 - (\frac{k}{4} - 1)n^3 &\leq kn^3 \\ \frac{k}{4} - 1 &\geq 0 \\ \frac{k}{4} &\geq 1 \\ \boxed{k \geq 4} \end{aligned}$$

$2n^3 \leq 4n^3$ ✓

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3

a.



Left Rotate: 1
Right Rotate: 1
Color Change: 2

b)



Left Rotate: 1
Right Rotate: 0
Color Change: 2

Since left subtree will also have the same black node height

4. 3, 9, 2, 8 $m=5$

a) $h(k, i) = (h'(k) + i) \bmod m$

$$h(3, 0) = ((3 \bmod 5) + 0) \bmod 5 = 3$$

$$h(9, 0) = ((9 \bmod 5) + 0) \bmod 5 = 4$$

$$h(2, 0) = ((2 \bmod 5) + 0) \bmod 5 = 2$$

$$h(8, 0) = ((8 \bmod 5) + 0) \bmod 5 = 3 \text{ *collide}$$

$$h(8, 1) = ((8 \bmod 5) + 1) \bmod 5 = 4 \text{ *collide}$$

$$h(8, 2) = ((8 \bmod 5) + 2) \bmod 5 = 0$$

0	8
1	
2	2
3	3
4	9

b) $h(k, i) = (h'(k) + i(h_2(k))) \bmod m$ $h_2(k) = (1 + (k \bmod 3))$

$$h(3, 0) = (3 \bmod 5 + 0(1 + 3 \bmod 3)) \bmod 5 = 3$$

$$h(9, 0) = (9 \bmod 5 + 0(1 + 9 \bmod 3)) \bmod 5 = 4$$

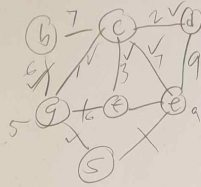
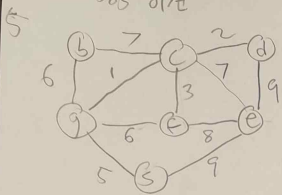
$$h(2, 0) = (2 \bmod 5 + 0(1 + 2 \bmod 3)) \bmod 5 = 2$$

$$h(8, 0) = (8 \bmod 5 + 0(1 + 8 \bmod 3)) \bmod 5 = 3 \text{ *collide}$$

$$h(8, 1) = (8 \bmod 5 + 1(1 + 8 \bmod 3)) \bmod 5 = 1$$

0	
1	8
2	2
3	3
4	9

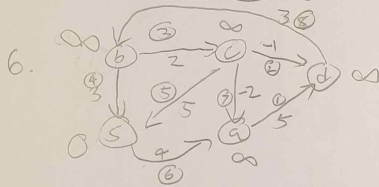
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a) edges: $\{(g,s), (c,g), (d,c), (f,c), (b,g), (e,c)\}$

b) $5+1+2+3+6+7 = \boxed{24}$

MST = 24



	key value of a	key value of b	key value of c	key value of d
End of pass 1	4	∞	∞	∞
End of pass 2	4	12	∞	9
End of pass 3	4	12	14	9
End of pass 4	4	12	14	9