Cps688 Midterm 2

Q#1) Masters Theorem

→ If $T(n) = aT(n/b) + \Theta(n^d)$

where $a > 0$, $b > 1$, and $d \geq 0$

$$T(n) = \begin{cases} \Theta(n^d) & \text{if } d > \log_b a \\ \Theta(n^d \log n) & \text{if } d = \log_b a \\ \Theta(n^{\log_b a}) & \text{if } d < \log_b a \end{cases}$$

Solve the runtime of: $T(n) = T(2n/3) + 1$

$a = 1$, $b = 3/2$, $d = 0$

if $d = \log_b a \Rightarrow \Theta(n^d \log n)$

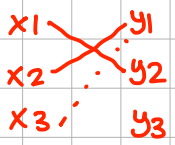
$0 = \log_{3/2} 1 = 0 \Rightarrow \Theta(n^d \log n) = \Theta(\log n)$

Q4): Gale-Shapely Algorethem

Given preference case:

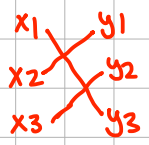
$x_1: y_2 > y_3 > y_1$	$y_1: x_1 > x_2 > x_3$
$x_2: y_1 > y_3 > y_2$	$y_2: x_2 > x_3 > x_1$
$x_3: y_1 > y_2 > y_3$	$y_3: x_3 > x_2 > x_1$

R1/



unstable

R2/



stable

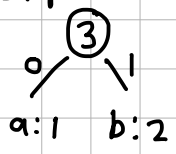
$m = \{\{x_3, y_2\}, \{x_2, y_1\}, \{x_1, y_3\}\}$

Q5) Example – Execution Huffmans Algorithm:

size queue = 7

[a:1] [b:2] [c:3] [d:5] [e:7] [f:11] [g:13] (Init)

Step 1:



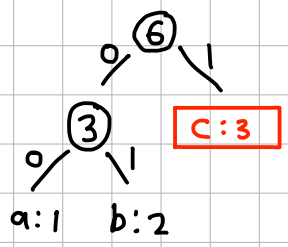
[c:3] [d:5] [e:7] [f:11] [g:13]

size queue = 6

Step 2:

[d:5] [e:7] [f:11] [g:13]

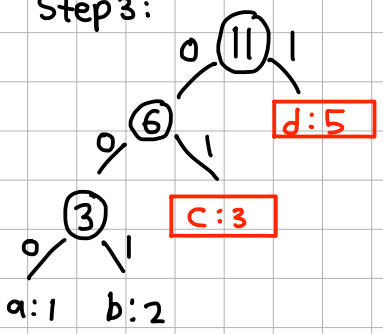
size queue = 5



Step 3:

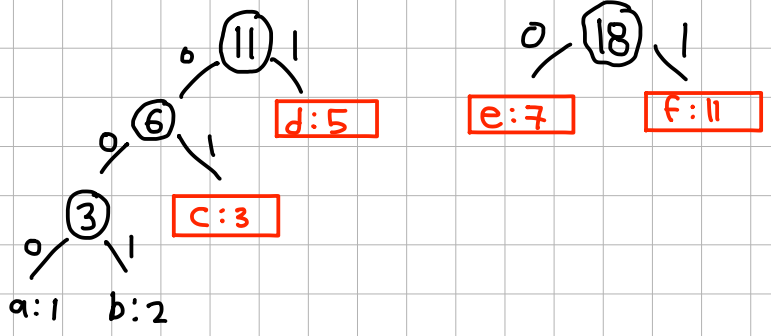
[f:11] [g:13]

size queue = 4



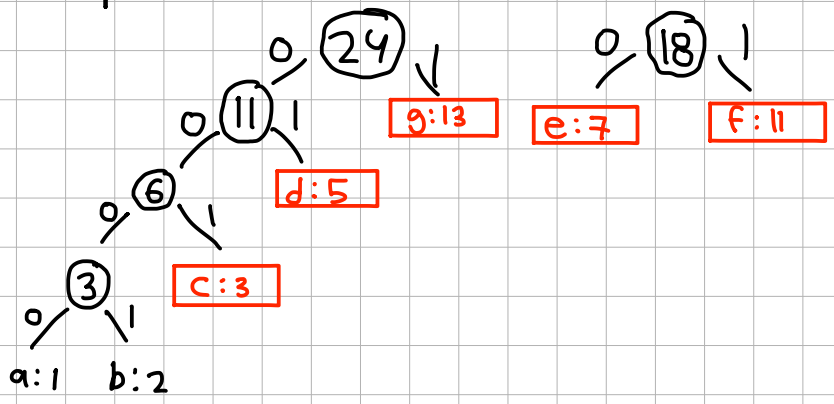
Step 4:

size queue = 3



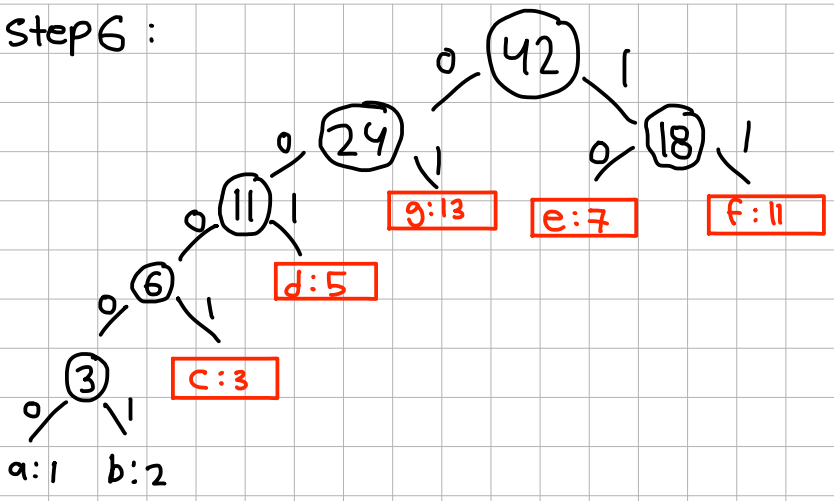
Step 5:

size queue = 2



step6 :

size queue = 1



a = 00000
b = 00001
c = 0001
d = 001
e = 10
f = 11
g = 01