

1) C

2) C, O

3) N
C, N, O → C-N-O

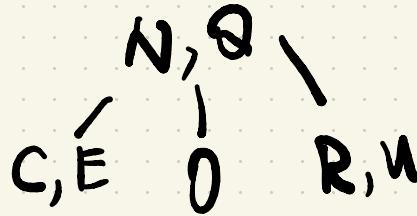
4) Q
C-N-O, Q

5) u
C-N-O QU → C-O-u

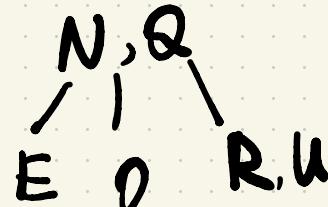
6) E

N, Q
/ | \
CE O u

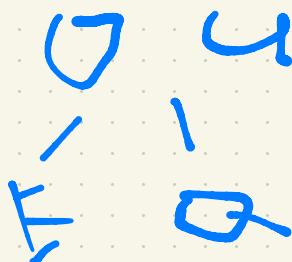
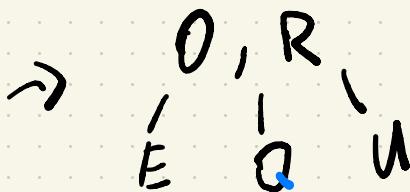
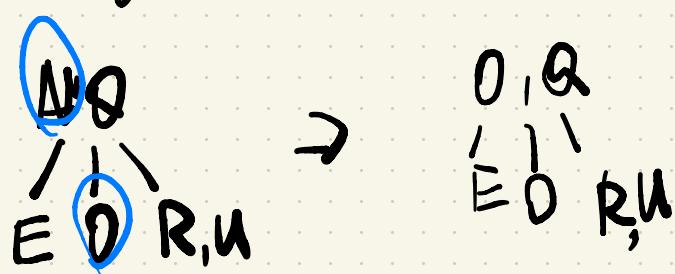
7> R



Remove C :



Remove N :



①^s S

②^p P, S

③^r A, P, S → A^{-P}_{-S}

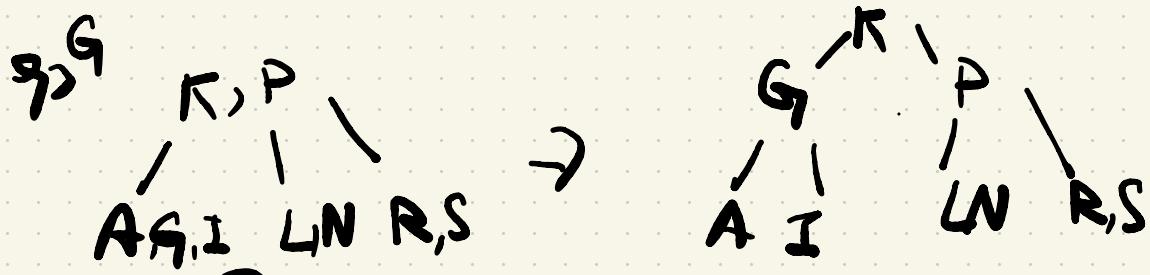
④^R A^{/P}_{R,S}

⑤^K A^{/P}_{K,R,S}

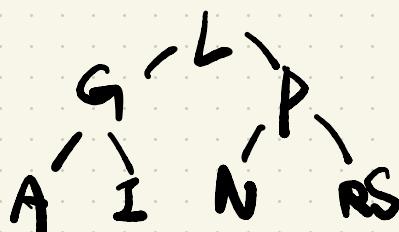
⑥^L A^{/P}_{K,L}_{R,S} → A^{/K,P}_L_{R,S}

⑦^I A^{/K,P}_{I,L}_{R,S}

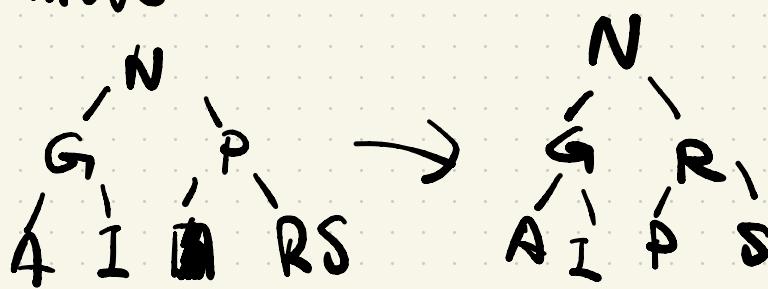
⑧^N A^{/K,P}_{I,L,N}_{R,S}



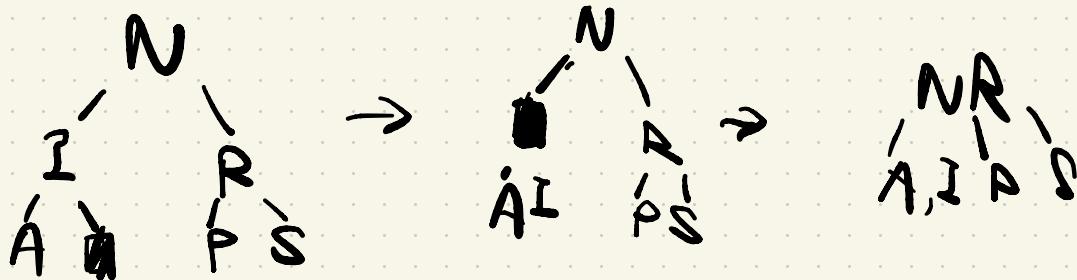
Remove K



remove L



Remove G₁



1) T T

2) E

E, T

3) D

D, E, T → D-E-T

4) I

D-E-I-T

5) O

D-E-I-O-T → D-E-O-T

6) U

D-E-O-T → D-E-O-T-U

7) S

D-E-O-T-U → D-E-O-S-U

Remove E

D-O-T-U → D-L-T-U → D-L-S-U

Remove I



Heap :

① 21

-∞, 21

② 21

13

→

13
21

-∞, 13, 21

③ 13

21
26

-∞, 13, 21, 26

④ 13

21
26

29

⑤ 13
21
26
29
6 → 6
29
21 → 13
29
21 → 16
29
21 -∞, 6, 13, 26
29, 21

⑥ 6

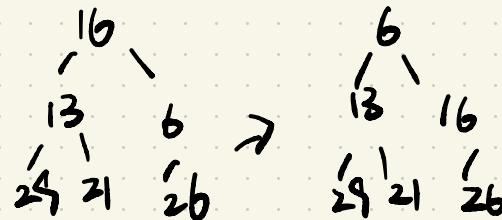
13
26
29
21
0

→ 13
29
21
26 → 13
29
21 → 0
13
29
21 -∞, 0, 13, 6, 29, 21, 26

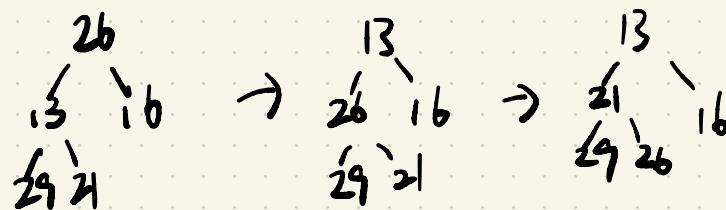


-20, 0, 13, 6, 29, 21, 26, 16

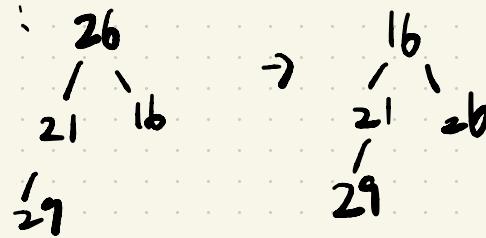
remove #1 :
Remove 0



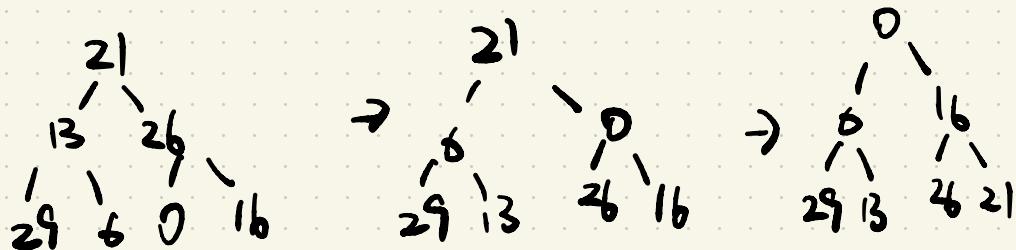
Remove 6 :

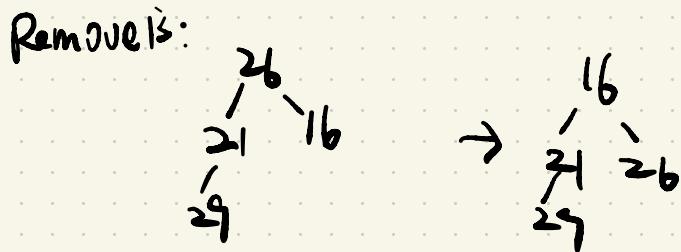
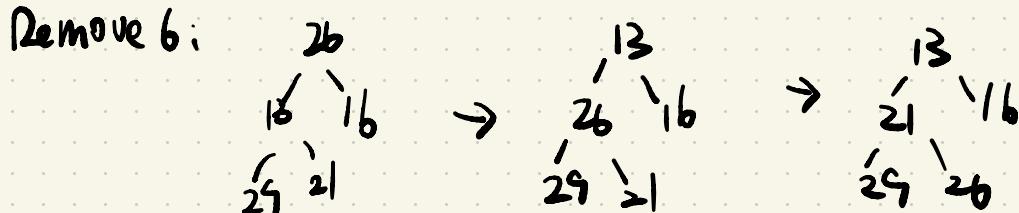
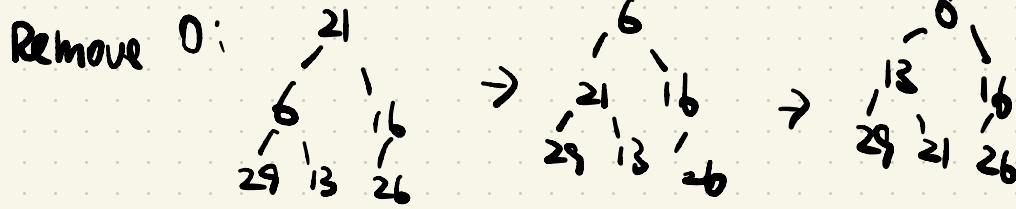


Remove 13 :



Bottom up:



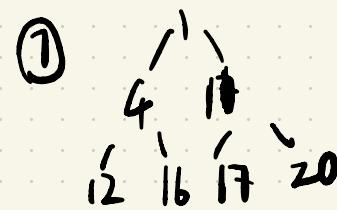
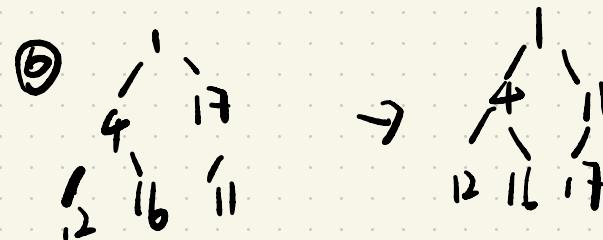
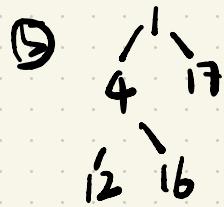


① 4 4

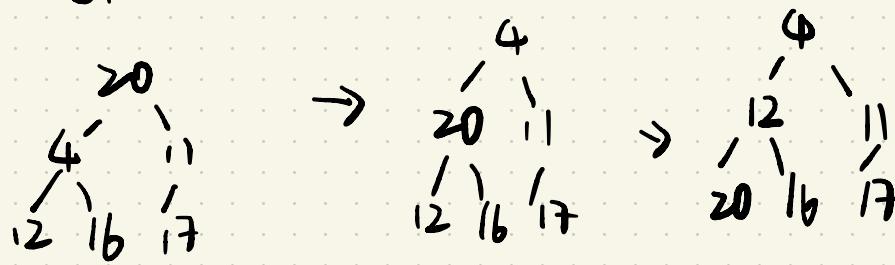
② 12 4

③ 4
12 17

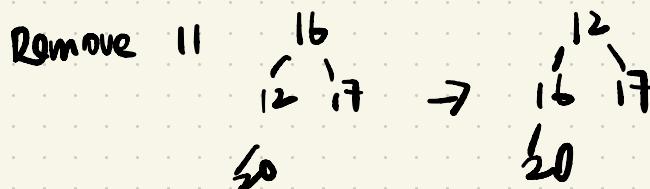
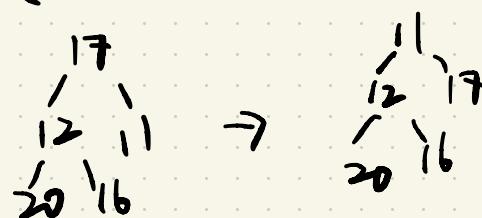
④ 4 4
12 17 → 12 4 17 → 12 4 17



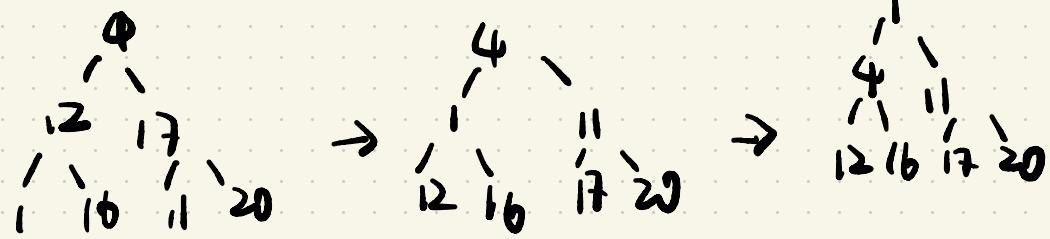
Remove 1:



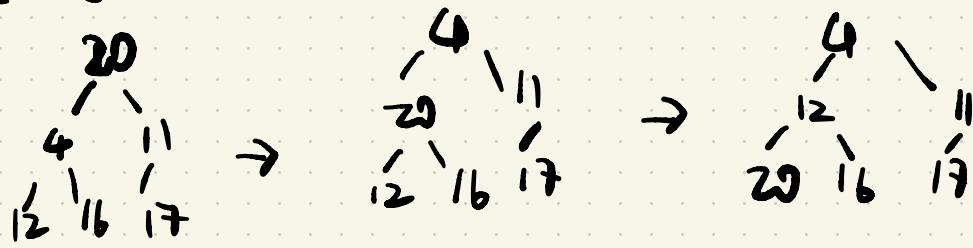
Remove 4:



Bottom up:



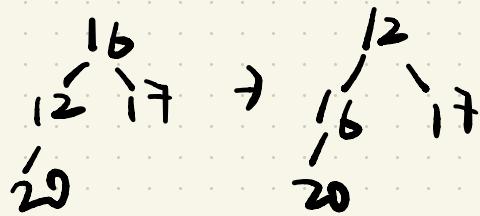
Remove 1:



Remove 4:



Remove 11:



$$\textcircled{1} \quad 20$$

$$\textcircled{2} \quad \begin{array}{c} 20 \\ / \quad \backslash \\ 2 \quad 2 \end{array} \quad \rightarrow \quad \begin{array}{c} 2 \\ / \quad \backslash \\ 20 \quad 20 \end{array}$$

$$\textcircled{3} \quad \begin{array}{c} 2 \\ / \quad \backslash \\ 20 \quad 15 \end{array}$$

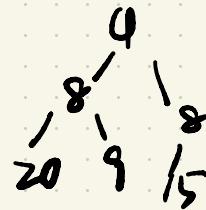
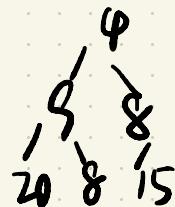
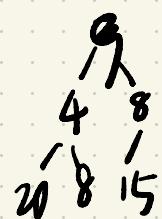
$$\textcircled{4} \quad \begin{array}{c} 2 \\ / \quad \backslash \\ 20 \quad 15 \\ / \quad \backslash \\ 8 \quad 8 \end{array} \quad \rightarrow \quad \begin{array}{c} 2 \\ / \quad \backslash \\ 8 \quad 15 \\ / \quad \backslash \\ 20 \quad 20 \end{array}$$

$$\textcircled{5} \quad \begin{array}{c} 2 \\ / \quad \backslash \\ 8 \quad 15 \\ / \quad \backslash \\ 20 \quad 4 \end{array} \quad \rightarrow \quad \begin{array}{c} 2 \\ / \quad \backslash \\ 4 \quad 15 \\ / \quad \backslash \\ 20 \quad 8 \end{array}$$

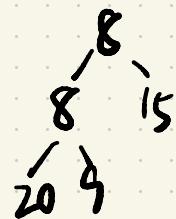
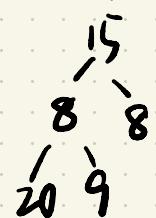
$$\textcircled{6} \quad \begin{array}{c} 2 \\ / \quad \backslash \\ 4 \quad 15 \\ / \quad \backslash \\ 20 \quad 8 \\ / \quad \backslash \\ 8 \quad 9 \end{array} \quad \rightarrow \quad \begin{array}{c} 2 \\ / \quad \backslash \\ 4 \quad 9 \\ / \quad \backslash \\ 20 \quad 8 \\ / \quad \backslash \\ 8 \quad 15 \end{array}$$

$$\textcircled{7} \quad \begin{array}{c} 2 \\ / \quad \backslash \\ 4 \quad 9 \\ / \quad \backslash \\ 20 \quad 8 \\ / \quad \backslash \\ 8 \quad 5 \\ / \quad \backslash \\ 8 \quad 8 \end{array} \quad \rightarrow \quad \begin{array}{c} 2 \\ / \quad \backslash \\ 4 \quad 8 \\ / \quad \backslash \\ 20 \quad 8 \\ / \quad \backslash \\ 8 \quad 15 \\ / \quad \backslash \\ 15 \quad 9 \end{array}$$

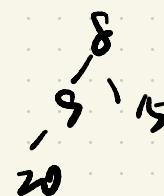
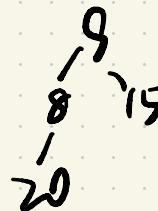
Remove 2



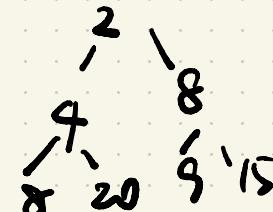
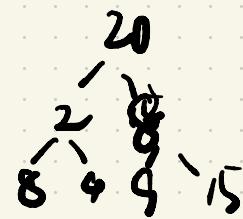
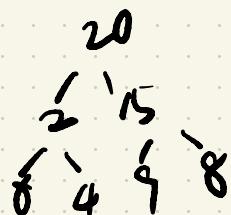
Remove 4



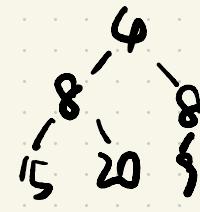
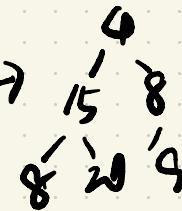
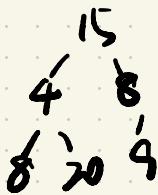
Remove 8



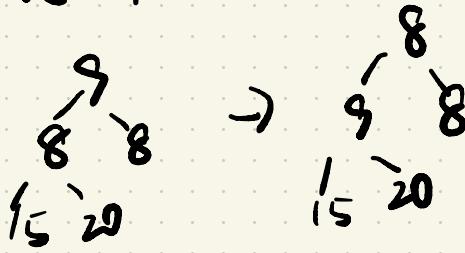
Bottom up



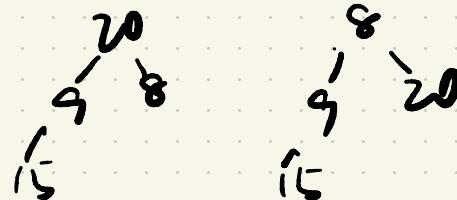
Remove 2



Remove 4

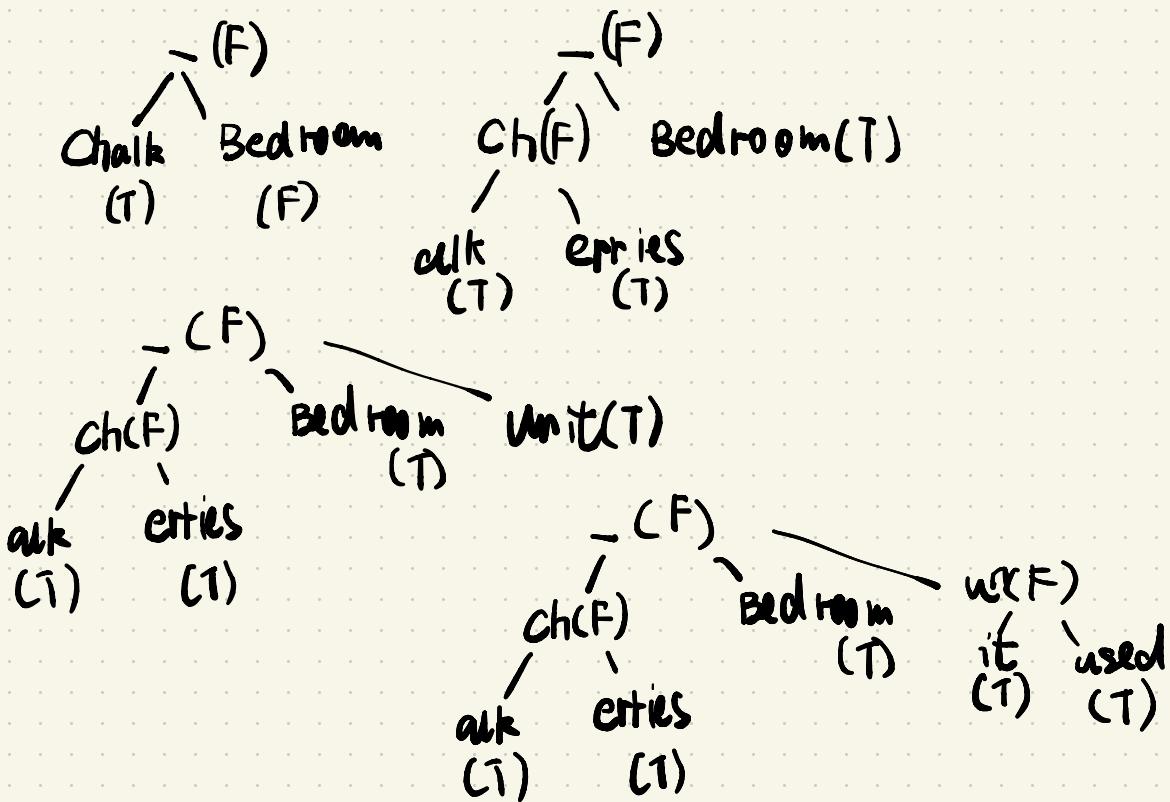


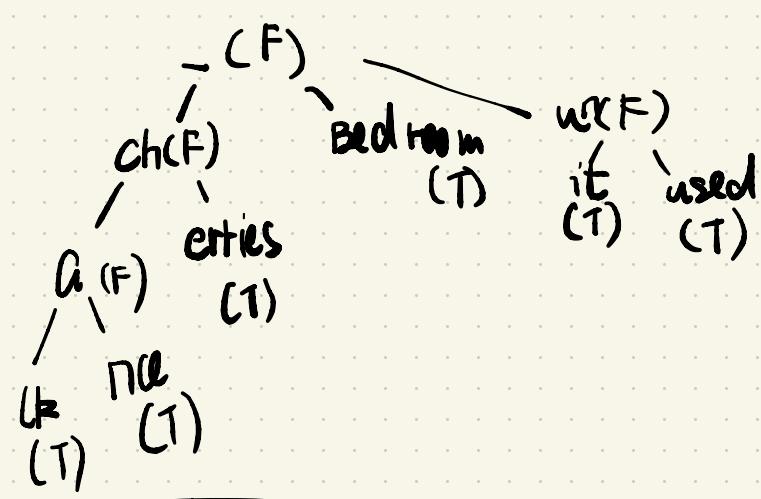
Remove 8



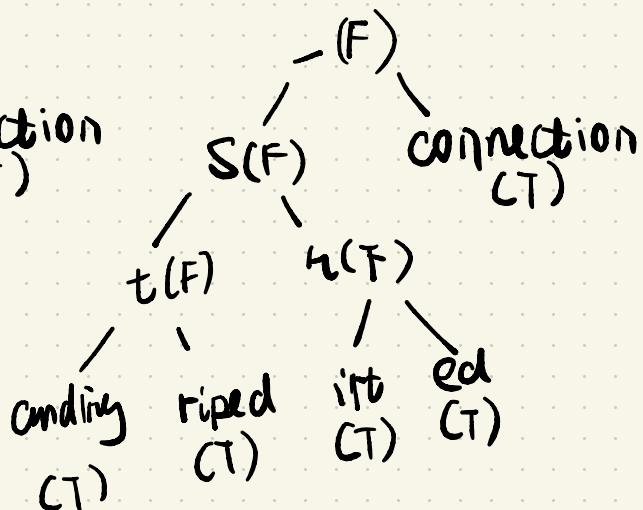
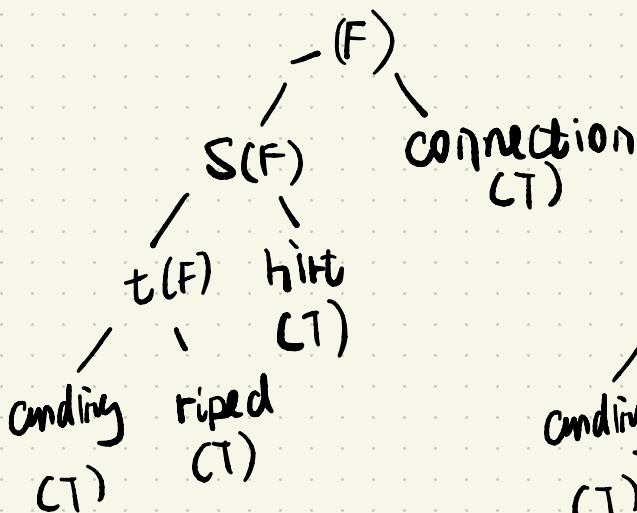
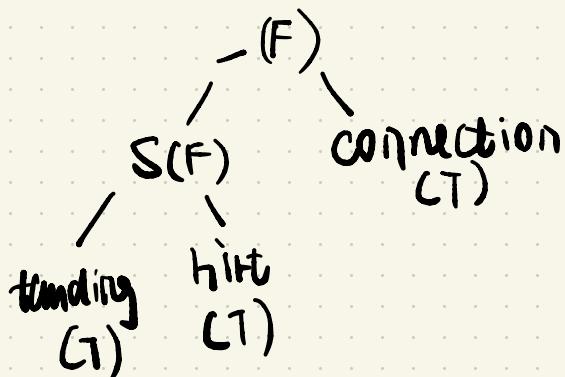
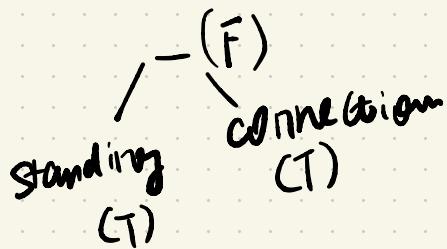
Compact Tree

chalk (T)

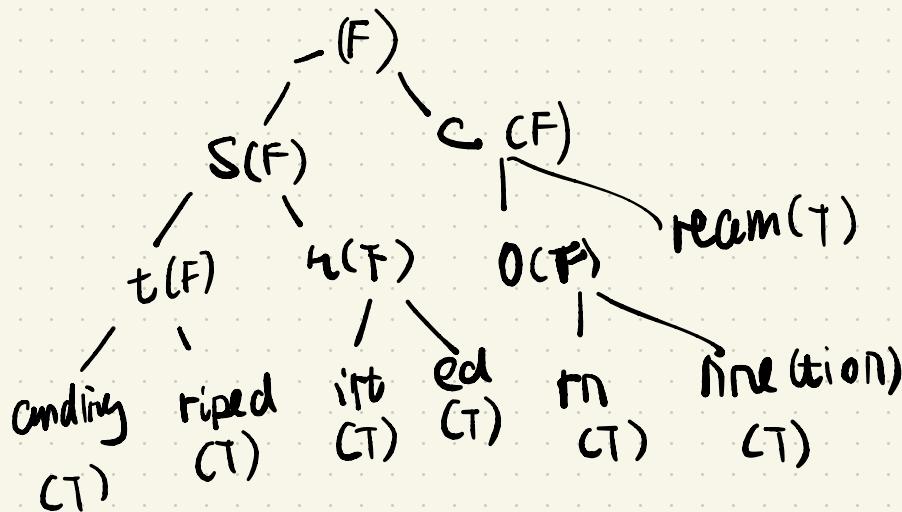
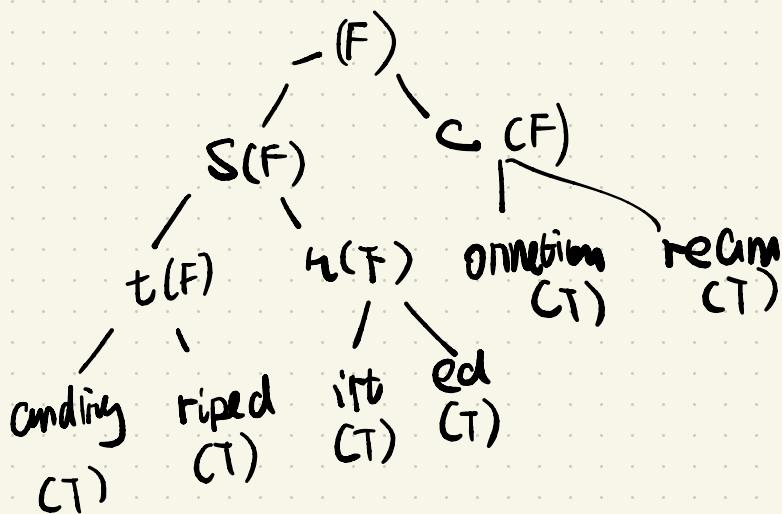


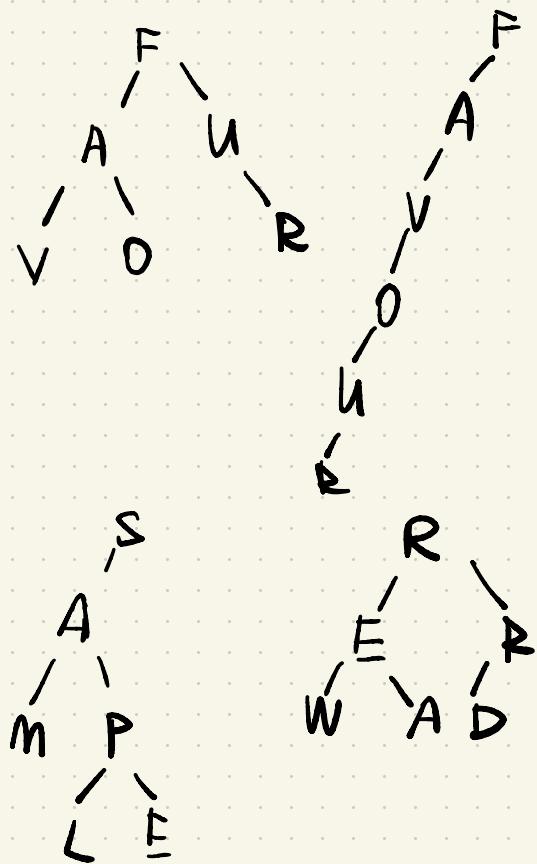


Standing (T)



hit
ed





" "

