

ALGORITHMS

Assignment 3 Report

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1 Exercise 1

1.1 i) (2 point)

Algorithm 1 Fibonacci_recur

```
0: procedure FIBONACCI_RECUR( $n$ )
0:   if  $n == 0$  then
0:     return  $n$ 
0:   else if  $n == 1$  then
0:     return  $n$ 
0:   else if  $n \geq 2$  then
0:     return  $Fibonacci\_recur(n - 1) + Fibonacci\_recur(n - 2)$ 
```

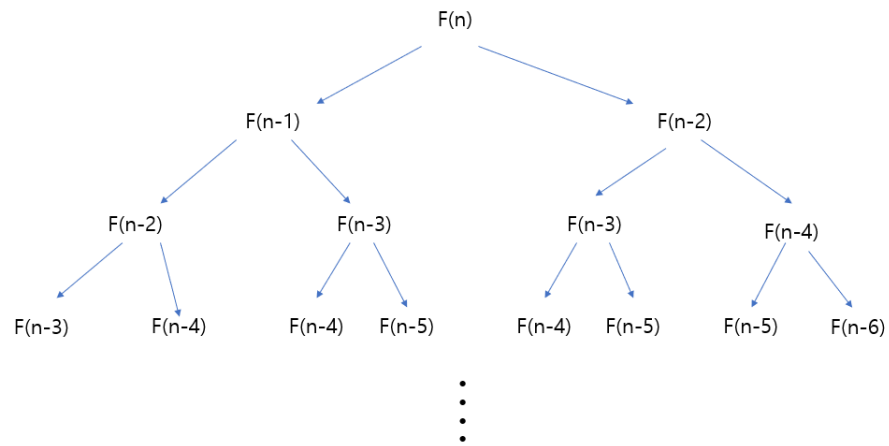
1.2 ii) (3 point)

Algorithm 2 Fibonacci_DP

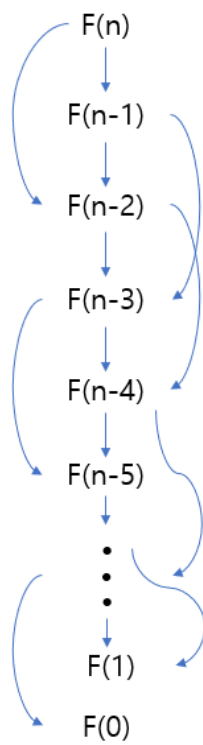
```
0: procedure FIBONACCI_DP( $n$ )
0:   create array  $D[0 \dots n]$ 
0:   if  $n \leq 1$  then
0:     return  $n$ 
0:   end if
0:    $D[0] = 0$ 
0:    $D[1] = 1$ 
0:   for  $i = 2$  to  $n$  do
0:      $D[i] = D[i-1] + D[i-2]$ 
0:   end for
0:   return  $D[n]$ 
```

1.3 iii) (5 point)

recursion tree



subproblem graph



1.4 iii) (5 point)

vertex : $n+1$ 개

정점은 $F(n)$ 부터 $F(0)$ 까지 $n+1$ 개 있다.

edge : $2n-2$ 개

$F(n)$ 부터 $F(2)$ 까지 간선이 각각 2개씩, $F(1)$ 과 $F(0)$ 에는 간선이 없다.

$Fibonacci_DP(n)$ 의 **running time**은 $O(n)$ 이다.

$Fibonacci_DP(n)$ 에 n 을 input값으로 넣었을 때, 2부터 n 까지 $n-1$ 번만큼 반복하며 피보나치 수열을 구하게 된다. 따라서 running time은 $O(n)$ 이다.

2 Exercise 2

2.1 i)

i	r_i	optimal solution
1	2	1 (no cuts)
2	4	1 + 1
3	8	3 (no cuts)
4	10	1 + 3
5	12	5 (no cuts)

2.2 ii)

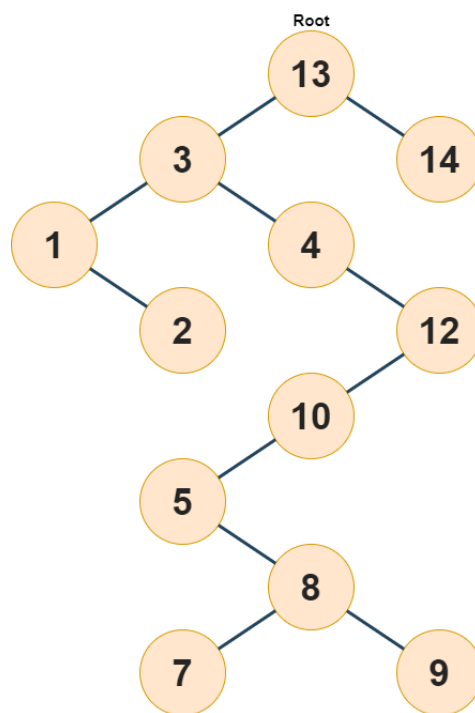
r_5	optimal solution
12	5 (no cuts)
12	3 + 1 + 1

2.3 iii)

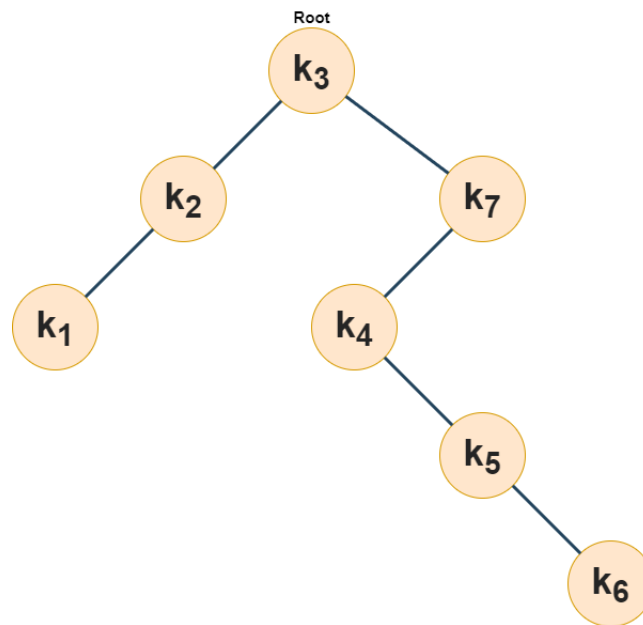
No, ii)의 solution 중에서 $3 + 1 + 1$ 의 경우, length가 1인 rod의 limit은 1이지만, 2개가 사용되었기 때문입니다.

3 Exercise 4

3.1



3.2



In this binary search tree, the cost is computed by

$$\{0 \cdot 0.15 + 1(0.22 + 0.25) + 2(0.18 + 0.1) + 3(0.06) + 4(0.04)\} + 1 = 2.37$$

3.3

