COMP108 Algorithmic Foundations

Tutorial 11 (Suggested Solution and Feedback) w/c 8th May 2017

1. (a) The table:

Subset	Weight	Value	Subset	Weight	Value
$\{I_1\}$	2	20	$\{I_2, I_4\}$	12	70
$\{I_2\}$	4	30	$\{I_3, I_4\}$	14	75
$\{I_3\}$	6	35	$\{I_1, I_2, I_3\}$	12	85
$\{I_4\}$	8	40	$\{I_1, I_2, I_4\}$	14	90
$\{I_1, I_2\}$	6	50	$\{I_1, I_3, I_4\}$	16	95
$\{I_1, I_3\}$	8	55	$\{I_2, I_3, I_4\}$	18	105
$\{I_1, I_4\}$	10	60	$\{I_1, I_2, I_3, I_4\}$	20	125
$\{I_2, I_3\}$	10	65			

   (b) $\{I_2, I_3\}$, value = 65

   (c) $\{I_4, I_1\}$, value = 60
   This is not the best solution.

2. (a) The table and intermediate steps

   - $f_1[1] = 30$, $f_2[1] = 30$
   - $f_1[2] = \min\{f_1[1] + 0 + 50, f_2[1] + 30 + 50\} = \min\{80, 110\} = 80$,
     $f_2[2] = \min\{f_1[1] + 40 + 20, f_2[1] + 0 + 20\} = \min\{90, 50\} = 50$
   - $f_1[3] = \min\{f_1[2] + 0 + 40, f_2[2] + 10 + 40\} = \min\{120, 100\} = 100$,
     $f_2[3] = \min\{f_1[2] + 10 + 40, f_2[2] + 0 + 40\} = \min\{130, 90\} = 90$
   - $f_1[4] = \min\{f_1[3] + 0 + 10, f_2[3] + 30 + 10\} = \min\{110, 130\} = 110$,
     $f_2[4] = \min\{f_1[3] + 20 + 50, f_2[3] + 0 + 50\} = \min\{170, 140\} = 140$

   You do not need to write the exact formula as above, but at least you have to put down the various values into the figure.

j	$f_1[j]$	$f_2[j]$
1	30	30
2	80	50
3	100	90
4	110	140

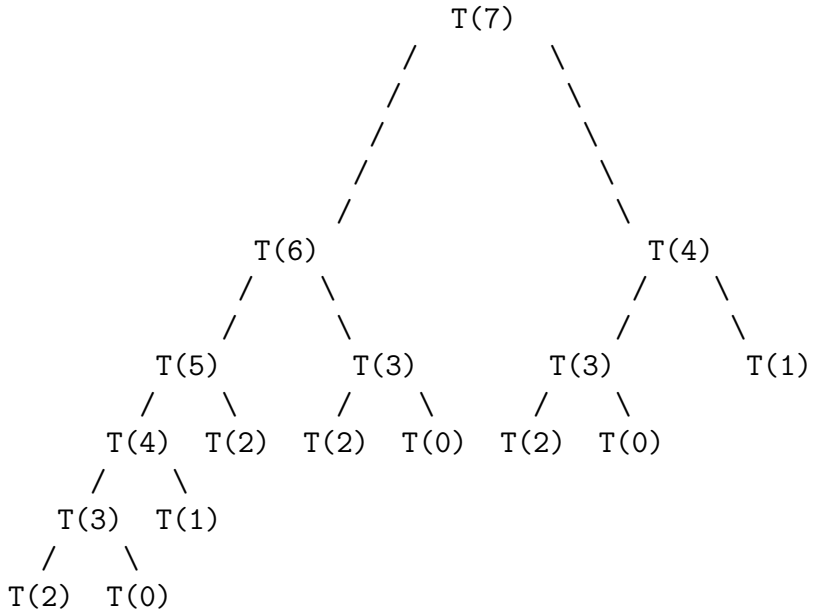
   (b) $f^* = \min\{f_1[4], f_2[4]\} = 110$

   (c) The stations chosen are $S_{2,1}$, $S_{2,2}$, $S_{1,3}$, and $S_{1,4}$.

3. (a) Procedure $T(n)$

if $n == 0$ or $n == 1$ **then**
    return 1
else if $n == 2$ **then**
    return 2
else
    return $T(n-1) + T(n-3)$

(b) Execution tree for $T(7)$



(c) Procedure $T(n)$

Set $A[0] = A[1] = 1$
Set $A[2] = 2$
for $i = 3$ to n **do**
    $A[i] = A[i-1] + A[i-3]$
return $A[n]$

4. Light three out of four ends. When two ends meet, light the fourth.