COMP2007 - Assignment 4

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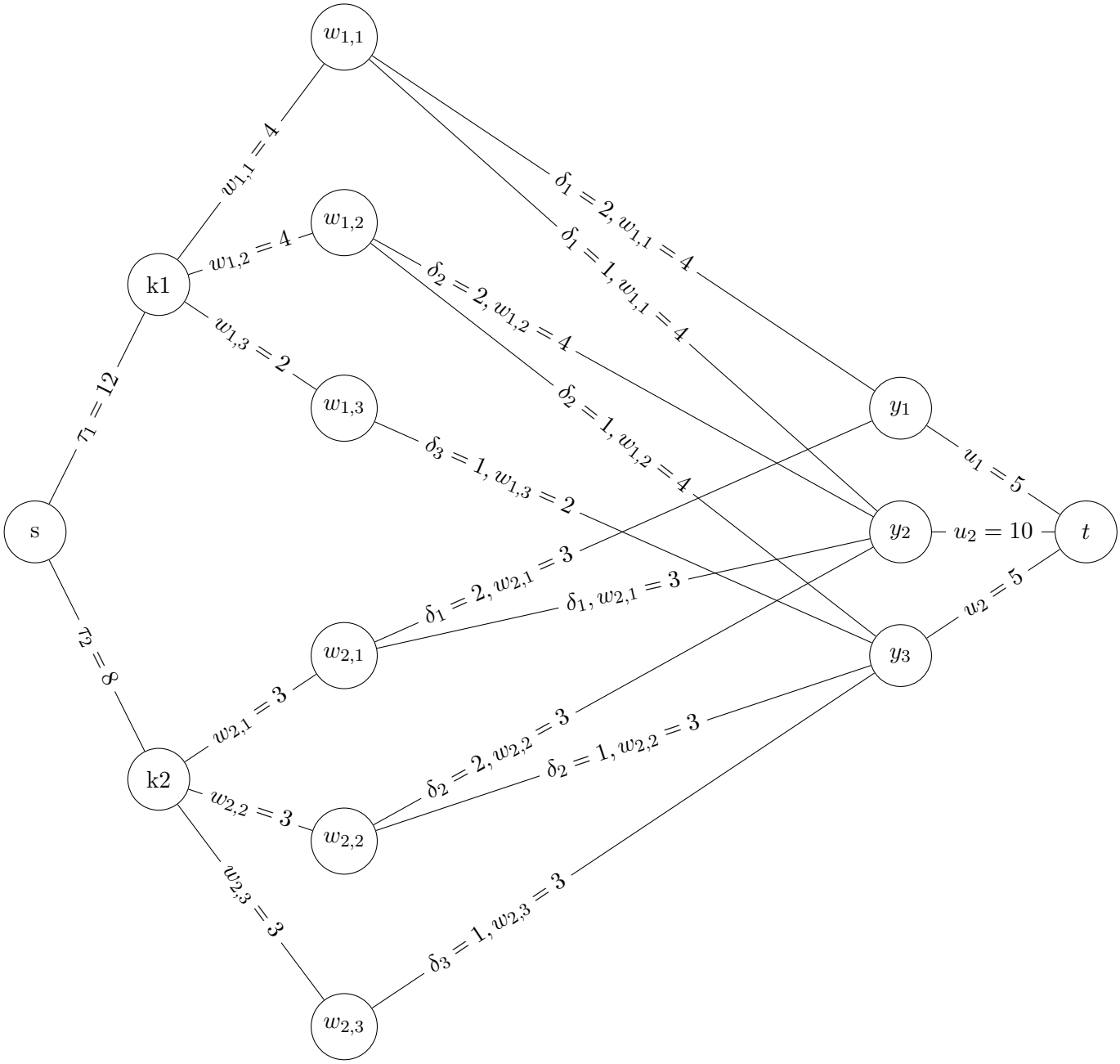
1. **Consider the case when $Y = 3, k = 2, \delta_1 = \delta_2 = 2$ and $\delta_3 = 1$**

   (a) **Formulate the problem of determining a schedule with maximum number of Christmas trees sold as a network flow problem.**



(b) **Argue why your algorithm is correct.**
In this case, we have several limitations, these are:

- k: the number of forests, in this case, 2.
- Y: the number of years, in this case, 3.
- τ_i: the maximum number of trees that can be harvested from forest i over the entire Y years. In this case, we say $\tau_1 = 12$ and $\tau_2 = 8$, meaning that we are restricted over the entire period to harvested 12 trees from forest 1 and 8 trees from forest 2.
- $w_{k,Y}$: the maximum number of trees that can be harvested from forest k in year Y. In this case we have $w_{1,1} = w_{1,2} = 4, w_{1,3} = 2$ and $w_{2,1} = w_{2,2} = w_{2,3} = 3$.
- δ_j: the lifetime of a tree harvested in year j, such that $\delta_1 = 3$ means a tree harvested in year 1 can only be sold in year 1,2 or 3. In this case, we have $\delta_1 = \delta_2 = 2$ and $\delta_3 = 1$
- u_i: The maximum number of trees that can be sold in year i. This does necessarily restrict the number of trees harvested, however, given for that year the δ_i value is greater than 1. In this case, we have $u_1 = u_2 = 5$ and $u_2 = 10$.

2. **Generalise your solution to k forests, Y years and variable tree lifespans.**

(a) **Formulate the problem of determining a schedule with maximum profit (maximum number of Christmas trees sold) as a network flow problem for a given Y, k and $\delta 1, ..., \delta Y$.**
Meme

(b) **Argue why your formulation is correct.**
Meme

(c) **Prove an upper bound on the time complexity of your algorithm.**
Meme