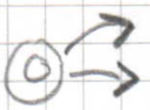
An example (VRP1)

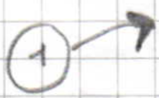
- $V = \{0, 1, 2, 3, 4, 5\}$ $K = 2$ $C = 5$

	1	2	3	4	5
d	2	1	4	1	1

(VRP1) $\min \sum_{(i,j)} c_{ij} x_{ij}$

 $x_{01} + x_{02} + x_{03} + x_{04} + x_{05} = 2$

 $x_{10} + x_{20} + x_{30} + x_{40} + x_{50} = 2$

 $x_{10} + x_{12} + x_{13} + x_{14} + x_{15} = 1$

 $x_{01} + x_{21} + x_{31} + x_{41} + x_{51} = 1$

< the same for customers >

2, 3, 4 and 5

* to avoid subtours *

ccc or GSEC or MTZ

* to impose vehicle capacity satisfaction *

$x_{01}, x_{02}, \ldots \in \{0, 1\}$

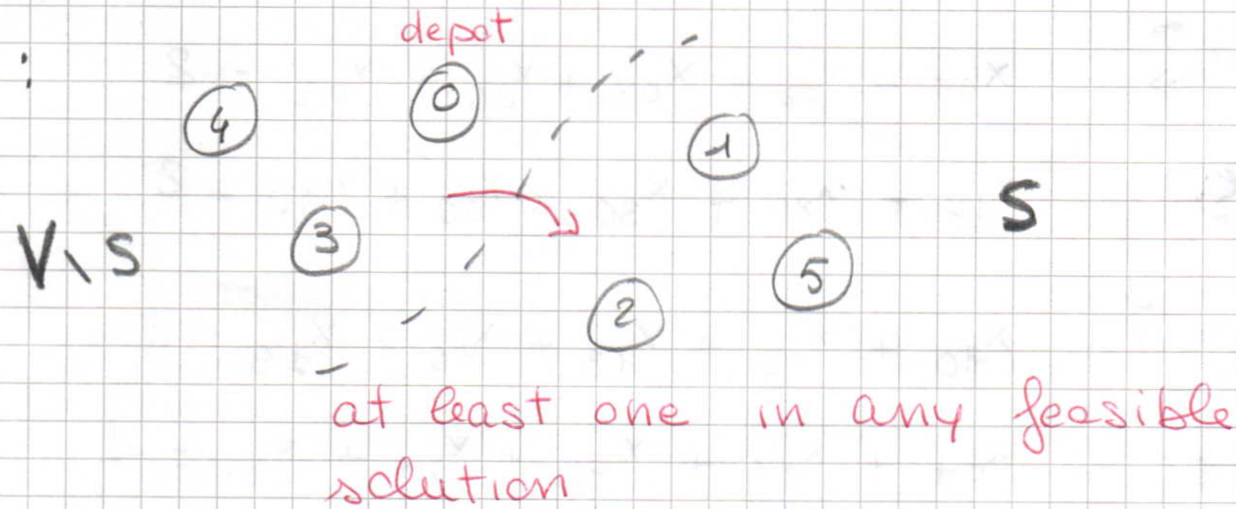
Some ccc constraints (one $\forall S \neq \emptyset$, $S \subseteq V \setminus \{0\}$):

- $S = \{1, 2, 5\}$

$$d_1 + d_2 + d_5 = 4 < C = 5 \rightarrow r(S) = 1$$

i.e. one vehicle is sufficient to serve all customers in S

so:



$$x_{01} + x_{02} + x_{05} + x_{31} + x_{32} + x_{35} + \\ + x_{41} + x_{42} + x_{45} \geq 1$$

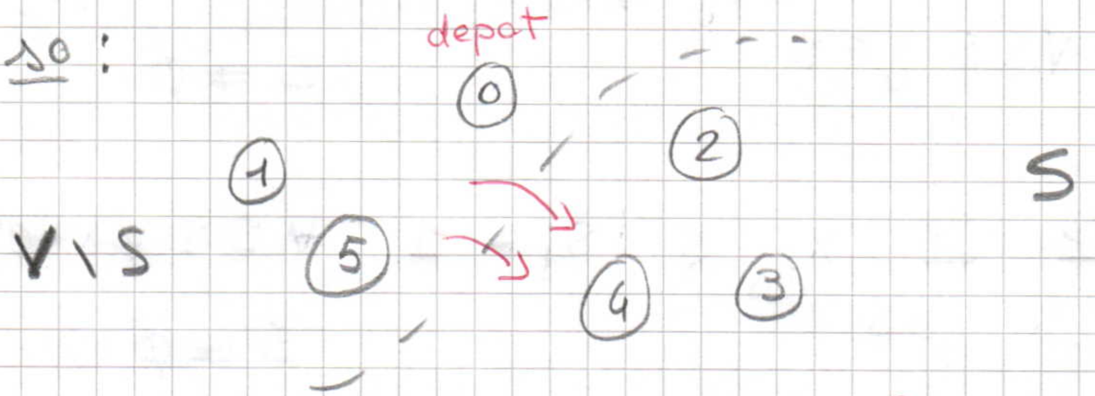
Obs: notice that we are imposing that this vehicle comes from $V \setminus S$, where there is the depot ($\equiv$ node 0)

- $S = \{2, 3, 4\}$

$d_2 + d_3 + d_4 = 6 > C = 5 \rightarrow r(S) = 2$

i.e. at least 2 vehicles are needed (for their capacity) to serve all customers in S

so:



at least two arcs (≡ vehicles) in any feasible solution

$$x_{02} + x_{03} + x_{04} + x_{12} + x_{13} + x_{14} + x_{52} + x_{53} + x_{54} \geq 2$$