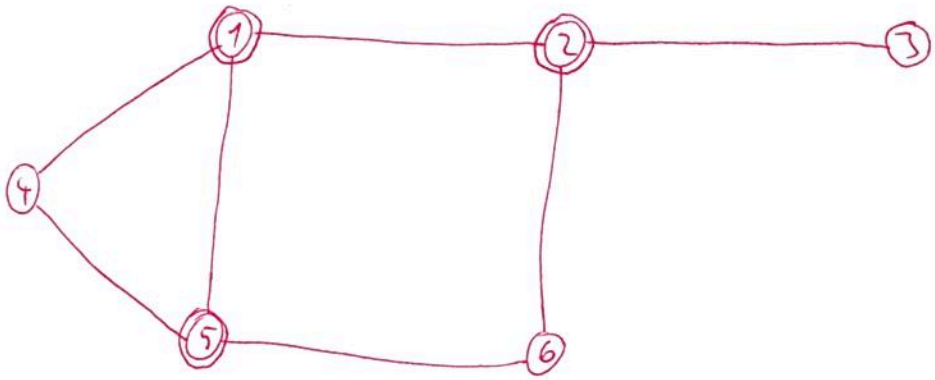
VERTEX COVER WITH ILP



VC. IN

$n = 6 \qquad m = 7$

$E = \{(1,2)_1, (2,3)_1, (1,4)_1, (4,5)_1, (1,5)_1, (5,6)_1, (2,6)\}$

ILP

MINIMIZE $x_1 + x_2 + x_3 + x_4 + x_5 + x_6$

SUBJECT TO

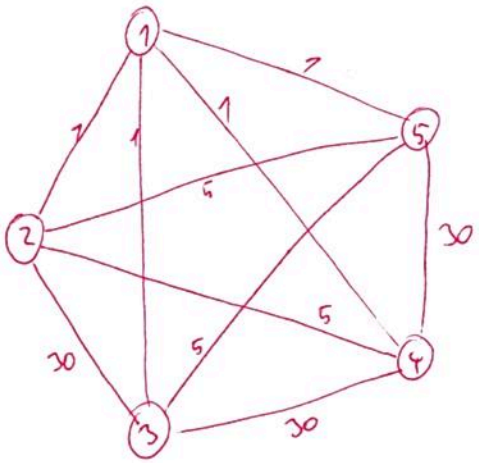
$x_1 + x_2 \geq 1$
$x_2 + x_3 \geq 1$
$x_1 + x_4 \geq 1$
$x_4 + x_5 \geq 1$
$x_1 + x_5 \geq 1$
$x_5 + x_6 \geq 1$
$x_2 + x_6 \geq 1$

} COVER EVERY EDGE OF THE GRAPH

$0 \leq x_1 \leq 1$
$0 \leq x_2 \leq 1$
$0 \leq x_3 \leq 1$
$0 \leq x_4 \leq 1$
$0 \leq x_5 \leq 1$
$0 \leq x_6 \leq 1$

} VERTEX IS IN THE COVER OR NOT

TSP WITH ILP



TSP5.IN

$n = 5$

$$d = \begin{matrix} 0 & 1 & 1 & 1 & 1 \\ 1 & 0 & 30 & 5 & 30 \\ 1 & 30 & 0 & 30 & 5 \\ 1 & 5 & 30 & 0 & 30 \\ 1 & 30 & 5 & 30 & 0 \end{matrix}$$

ILP

MINIMIZE $\sum_{i=1}^{n} \sum_{j=1, i \neq j}^{n} d_{ij} x_{ij}$

$$0 \leq x_{ij} \leq 1 \quad ; i, j \in \{1, \dots, n\}$$

THERE IS 1 INCOMING EDGE $\Rightarrow \sum_{i=1, i \neq j}^{n} x_{ij} = 1 \quad ; j \in \{1, \dots, n\}$

THERE IS 1 OUTGOING EDGE $\Rightarrow \sum_{j=1, i \neq j}^{n} x_{ij} = 1 \quad ; i \in \{1, \dots, n\}$

ORDERING OF CITIES $1 \leq u_i \leq n-1 \quad ; i \in \{2, \dots, n\}$

SINGLE TOUR COVERING ALL CITIES $u_i - u_j + n x_{ij} \leq n-1 \quad ; i, j \in \{2, \dots, n\}, i \neq j$