

$$\min \sum_{(i,j) \in E} c_{ij} \sum_{k \in K} x_{ij}^k$$

subject to

$$\sum_{k \in K} y_i^k = 1, \quad \forall i \in V',$$

$$\sum_{k \in K} y_0^k = K,$$

$$\sum_{(i,j) \in E} x_{ij}^k = 2y_i^k, \quad \forall i \in V, \forall k \in K,$$

$$\sum_{i \in V} d_i y_i^k \leq Q, \quad \forall k \in K,$$

$$\sum_{(i,j) \in S} x_{ij}^k \leq |S| - 1, \quad \forall S \subseteq V', |S| \geq 2, \forall k \in K,$$

$$y_i^k \in \{0, 1\}, \quad \forall i \in V, \forall k \in K,$$

$$x_{ij}^k \in \{0, 1\}, \quad \forall i, j \in V', \forall k \in K,$$

$$x_{0j}^k \in \{0, 1, 2\}, \quad \forall j \in V', \forall k \in K.$$