1.1 let $n=|E|$, $m=|V|$ then,

the binary integer problem is :

$$\min\{cx : x\in S\},\ S=\{x\in\{0,1\}^n : Ax\leqslant b,\ T=\{e: x_e=1\} \text{ is a spannig tree}\}$$

$c=(c_1,\cdots,c_n)$, $c_i=w(i)$

$b=(k_1,\cdots,k_m)^T$

$A=(A_{ij})_{m\times n}$ $\quad A_{ij}=\begin{cases}1, & \text{if } x_j\in\delta(i)\\ 0, & \text{if } x_j\notin\delta(i)\end{cases}$

1.2 pf: suppose $T\subseteq G$ is a minimum weight spanning tree, x^* is the optimal solution of MST, x^0 is the optimal solution of DCMST

Since x^* is the solution of $\min\{c\cdot x : x\in P\}$,

$P=\{x\in\{0,1\}^n : T=\{e: x_e=1\} \text{ is a spanning tree}\}$

Since $S\subseteq P$, we can know that $cx^*\leqslant cx^0$

which means it's a lower boud on the optimal value

1.3 Algorithm for solving MDCST problem:

1. solve the MST problem and get a minimum weight spanning tree T
2. for all the node $i\in V$, if $|\delta(i)\cap T|>k_i$, delet $(k_i-|\delta(i)\cap T|)$ edges that adjacent to i from $G=(V,E)$. we got a subgraph $G'\subseteq G$
3. solve the MST problem in this subgraph