data:

$$\boldsymbol{S_k^{gl}}, \boldsymbol{S_k^{gu}} \ \ \forall k \in G$$

$$\boldsymbol{c}_{2k}, \boldsymbol{c}_{1k}, \boldsymbol{c}_{0k} \ \ \forall k \in G$$

$$\boldsymbol{v_i^l}, \boldsymbol{v_i^u} \ \ \forall i \in N$$

$$\boldsymbol{S_i^d}, \boldsymbol{Y_i^s} \ \ \forall i \in N$$

$$\boldsymbol{Y}_{ij}, \boldsymbol{b_{ij}^c}, \boldsymbol{T}_{ij} \ \ \forall (i,j) \in E$$

$$\boldsymbol{s_{ij}^u}, \boldsymbol{\theta_{ij}^{\Delta l}}, \boldsymbol{\theta_{ij}^{\Delta u}} \ \ \forall (i,j) \in E$$

variables:

$$S_k^g \ \ \forall k \in G$$

$$V_i \ \ \forall i \in N$$

$$S_{ij} \ \ \forall (i,j) \in E \cup E^R$$

minimize:
$$\sum_{k \in G} \boldsymbol{c}_{2k}(\Re(S_k^g))^2 + \boldsymbol{c}_{1k}\Re(S_k^g) + \boldsymbol{c}_{0k} \tag{1}$$

subject to:

$$\boldsymbol{S_k^{gl}} \leq S_k^g \leq \boldsymbol{S_k^{gu}} \ \ \forall k \in G \tag{2}$$

$$\boldsymbol{v_i^l} \leq |V_i| \leq \boldsymbol{v_i^u} \ \ \forall i \in N \tag{3}$$

$$\sum_{k \in G_i} S_k^g - \boldsymbol{S_i^d} - \boldsymbol{Y_i^s}|V_i|^2 = \sum_{(i,j) \in E_i \cup E_i^R} S_{ij} \ \ \forall i \in N \tag{4}$$

$$S_{ij} = \left(\boldsymbol{Y}_{ij}^* - \boldsymbol{i}\frac{\boldsymbol{b_{ij}^c}}{2}\right)\frac{|V_i|^2}{|\boldsymbol{T}_{ij}|^2} - \boldsymbol{Y}_{ij}^*\frac{V_i V_j^*}{\boldsymbol{T}_{ij}} \ \ \forall (i,j) \in E \tag{5}$$

$$S_{ji} = \left(\boldsymbol{Y}_{ij}^* - \boldsymbol{i}\frac{\boldsymbol{b_{ij}^c}}{2}\right)|V_j|^2 - \boldsymbol{Y}_{ij}^*\frac{V_i^* V_j}{\boldsymbol{T}_{ij}^*} \ \ \forall (i,j) \in E \tag{6}$$

$$|S_{ij}| \leq \boldsymbol{s_{ij}^u} \ \ \forall (i,j) \in E \cup E^R \tag{7}$$

$$-\boldsymbol{\theta_{ij}^{\Delta l}} \leq \angle(V_i V_j^*) \leq \boldsymbol{\theta_{ij}^{\Delta u}} \ \ \forall (i,j) \in E \tag{8}$$