binary relaxation

$$\left(\Omega_k(\mathcal{S})\right)^k = \min_{\phi(\mathcal{S})=\mathbf{0}} \frac{\phi^\top \boldsymbol{\mathcal{L}}^k \phi}{\phi^\top \phi} \approx \min_{\mathbf{x}} \left(\frac{\mathbf{x}^\top \boldsymbol{\mathcal{L}}^k \mathbf{x}}{\mathbf{x}^\top \mathbf{x}} + \alpha \frac{\mathbf{x}^\top \mathrm{diag}(\mathbf{t}) \mathbf{x}}{\mathbf{x}^\top \mathbf{x}} \right) \Bigg|_{\mathbf{t}=\mathbf{1}_{\mathcal{S}}} = \lambda_k^\alpha(\mathbf{t})\big|_{\mathbf{t}=\mathbf{1}_{\mathcal{S}}}$$

relax the constraint