The goal is, given a vector $[q_1...q_N]$ and a constant A, find an assignment to $\boldsymbol{\tau}$ to minimize (or approximately minimize) the following function subject to the constraint that the τ's sum to 1, $\sum_{i=1}^{N}(\tau_{i0} + \tau_{i1}) = h$

$$f(\boldsymbol{\tau}) = \sum_{i=1}^{N} e^{-A(\tau_{i1} + q_i^2 \sum_{a \neq i} c_a)} + \sum_{i=1}^{N} e^{-A(\tau_{i0} + (1-q_i)^2 \sum_{a \neq i} c_a)} \tag{1}$$

$$\text{,where } c_a := \frac{\tau_{a1}\tau_{a0}}{\tau_{a1}(1-q_a)^2 + \tau_{a0}q_a^2} \tag{2}$$

$\boldsymbol{\tau}$ is a vector of positive integers of length $2N$, $[\tau_{10}, \tau_{11}, \tau_{20}, \tau_{21}...\tau_{N0}, \tau_{N1}]$

$[q_1...q_N]$ is a vector of length N, where $0 \leq q_i \leq 1$ for all i

A is constant, $0 < A < 1$

h is a positive constant. You can assume $h > 2N$.

The solution then plays a role in a larger proof - so I need an analytical solution.