Optimization Functional

$$J(\{\varepsilon_k(t)\}) = J_T(\{|\psi_k(T)\rangle\}) + \int_0^T g_a(\{\varepsilon_k(t)\})\,dt + \int_0^T g_b(\{\psi_k(t)\})\,dt$$

CNOT gate $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{pmatrix}$

$|00\rangle \to |00\rangle$, $|01\rangle \to |01\rangle$,

$|10\rangle \to |11\rangle$, $|11\rangle \to |10\rangle$

$$J_T = 1 - \left| \frac{1}{4} \sum_k \langle \psi_k(T) | \psi_k^{tgt} \rangle \right|^2$$