We know that for any Dyck path from $(0, 0)$ to $(2n, 0)$ satisfy the following:

- For each $0 \leq i \leq 2n$, the path passes through (i, k), for some $k \in \mathbb{Z}_{\geq 0}$, and
- if $i < 2n$, then the path can next visit $(i + 1, k + 1)$, or, if $k > 0$, $(i + 1, k - 1)$. We will call these cases "going up" and "going down", respectively.

For $0 < j \leq 2n$, let the j-th symbol of our expression be '(', if the path is going up in the j-th iteration, and ')' otherwise. It is easy to see that this forms the required bijection.