

$$\begin{array}{c}
 |1_0\rangle \cdot \cdot \cdot |1_n\rangle |0_{n+1}\rangle \cdot \cdot \cdot |0_m\rangle \\
 \downarrow \qquad \qquad \downarrow \qquad \qquad \downarrow \qquad \qquad \downarrow \\
 \boxed{\hat{a}_i^\dagger \rightarrow \sum_{j=1}^m U_{i,j} \hat{a}_j^\dagger} \\
 \downarrow \qquad \qquad \downarrow \qquad \qquad \downarrow \qquad \qquad \downarrow \\
 \sum_{\substack{s_1, \dots, s_m \\ s_1 + \dots + s_m = n}} U |s_1, \dots, s_m\rangle
 \end{array}$$