Homework 9

(1)

$$|\psi_{123}\rangle = (a|0\rangle + b|1\rangle) \otimes |\Phi^-_{23}\rangle$$

$$|\psi_{123}\rangle = (a|0\rangle + b|1\rangle) \otimes |\Phi^+_{23}\rangle$$

$$|\phi^-_{23}\rangle = 1/\sqrt{2}\,(|0\rangle_2 \otimes |0\rangle_3 - |1\rangle_2 \otimes |1\rangle_3)$$

$$\rightarrow 1/\sqrt{2}\,(|0,0\rangle - |1,1\rangle)$$

$$|\psi_{123}\rangle = (a|0,0,0\rangle + b|1,0,0\rangle - a|0,1,1\rangle - b|1,1,1\rangle)$$

$$|\phi^+_{23}\rangle = 1/\sqrt{2}\,(|0\rangle_2 \otimes |0\rangle_3 + |1\rangle_2 \otimes |1\rangle_3)$$

$$\rightarrow 1/\sqrt{2}\,(|0,0\rangle + |1,1\rangle)$$

$$|\psi_{123}\rangle = (a|0,0,0\rangle + b|1,0,0\rangle + a|0,1,1\rangle + b|1,1,1\rangle)$$

$$a|0,0,0\rangle = \frac{a}{\sqrt{2}}(|\varphi^+,0\rangle + |\varphi^-,0\rangle) \quad b|1,0,0\rangle = \frac{b}{\sqrt{2}}(|\psi^+,0\rangle - |\psi^-,0\rangle)$$

$$a|0,1,1\rangle = \frac{a}{\sqrt{2}}(|\psi^+,1\rangle + |\psi^-,1\rangle) \quad b|1,1,1\rangle = \frac{b}{\sqrt{2}}(|\varphi^+,1\rangle + |\varphi^-,1\rangle)$$

$$|\psi\rangle = 1/2\,(a(|\varphi^+,0\rangle + |\varphi^-,0\rangle) + b(|\psi^+,0\rangle - |\psi^-,0\rangle) + a(|\psi^+,1\rangle + |\psi^-,1\rangle) + b(|\varphi^+,1\rangle + |\varphi^-,1\rangle))$$

$$|\psi\rangle = 1/2\,(|\psi^+\rangle \otimes (a|1\rangle + b|0\rangle) + |\psi^-\rangle \otimes (a|1\rangle + b|0\rangle) + |\varphi^+\rangle \otimes (a|0\rangle + b|1\rangle) + |\varphi^-\rangle \otimes (a|0\rangle + b|1\rangle))$$