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14.5/15 nice!

a: Alice joins 1
b: Bob joins 1
c: Claire joins 1

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1)

1) If Alice joins group 1, Bob cannot join group 1

$$(a \rightarrow \neg b)$$ ✓

2) At least one of b or c is false

$$(\neg b \vee \neg c)$$ ✓

3) Claire and Alice cannot be in same group

$$(\neg a \wedge c) \vee (a \wedge \neg c)$$

$$\equiv (a \otimes c)$$ ✓

4) Alice wants to be in the same group with either Bob or Claire

$$(a \leftrightarrow b) \vee (a \leftrightarrow c)$$ ✓

a	b	c	a→¬b	¬b ∨ ¬c	a⊗b	(a↔b) ∨ (a↔c)
0	0	0	1	1	0	1
0	0	1	1	1	1	1
0	1	0	1	1	0	1
0	1	1	1	0	1	0
1	0	0	1	1	1	0
1	0	1	1	1	0	1
1	1	0	0	1	1	1
1	1	1	0	0	0	1

✓

a = 0
b = 0
c = 1

Alice is in Group 2
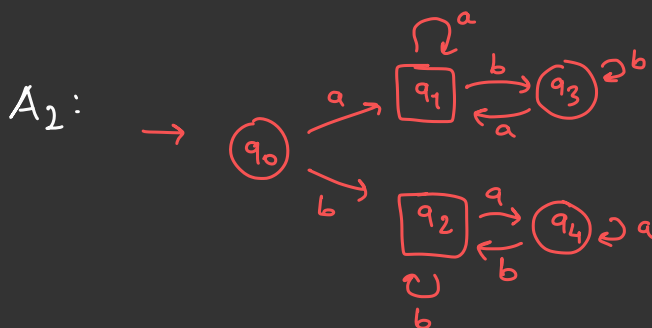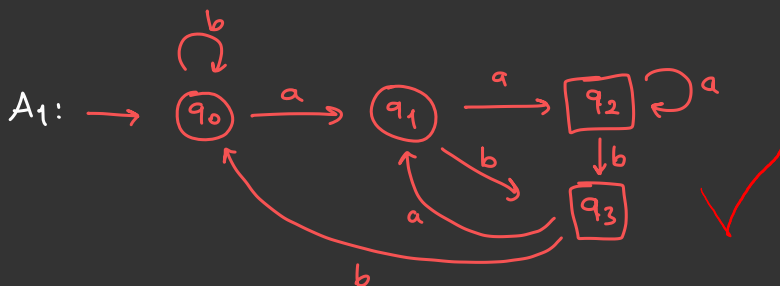Bob is in Group 2
Claire is in Group 1

✓

2)

a) $L_1 = \{ x_0 x_1 \dots x_n \mid (n \in \mathbb{N}_1) \wedge (\forall i \leq n.\ x_i \in \Sigma) \wedge x_{n-1} = a \}$ ✓

$L_2 = \{ x_0 x_1 \dots x_n \mid (n \in \mathbb{N}_0) \wedge (\forall i \leq n.\ x_i \in \cancel{\Sigma}) \wedge (x_0 = x_n) \}$

$\Sigma \sim 0.5$

$\boxed{2.5/3}$

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b)

$A_1 :$

✓

$A_2 :$

✓

$\boxed{3/3}$

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c)

$A_1 = \{ Q_1, \Sigma_1, \delta_1, Q_1^{init}, F_1 \}$ ✓

$Q_1 = \{ q_0, q_1, q_2, q_3 \}$

$\Sigma_1 = \{ a, b \}$

$\delta_1 = \{ (q_0, b, q_0),\ (q_0, a, q_1),$
$(q_1, a, q_2),\ (q_2, a, q_2),$
$(q_2, b, q_3),\ (q_3, a, q_1),$
$(q_1, b, q_3),\ (q_3, b, q_0) \}$

$Q_1^{init} = \{ q_0 \}$

$F_1 = \{ q_2, q_3 \}$

$A_2 = \{ Q_2, \Sigma_2, \delta_2, Q_2^{init}, F_2 \}$

$Q_2 = \{ q_0, q_1, q_2, q_3, q_4 \}$ ✓

$\Sigma_2 = \{ a, b \}$

$\delta_2 = \{ (q_0, a, q_1),\ (q_0, b, q_2),$
$(q_1, a, q_1),\ (q_2, b, q_2),$
$(q_1, b, q_3),\ (q_2, a, q_4),$
$(q_3, b, q_3),\ (q_4, a, q_4),$
$(q_3, a, q_1),\ (q_4, b, q_2) \}$

$Q_2^{init} = \{ q_0 \}$

$F_2 = \{ q_1, q_2 \}$

$\boxed{3/3}$