Exercise Sheet 2 - Logic

1. $(P_0 \lor P_1) \land (q_0 \lor q_1) \land (r_0 \lor r_1) \land (S_0 \lor S_1)$ each cell must contain either 0 or 1

$\land (\neg P_0 \lor \neg P_1) \land (\neg q_0 \lor \neg q_1) \land (\neg r_0 \lor \neg r_1) \land (\neg S_0 \lor \neg S_1)$ each cell can not contain both 0 or 1

$\left. \begin{array}{l} \land (P_0 \lor q_0) \land (r_0 \lor S_0) \\ \land (P_1 \lor q_1) \land (r_1 \lor S_1) \end{array} \right\}$ for rows

$\left. \begin{array}{l} \land (P_0 \lor r_0) \land (q_0 \lor S_0) \\ \land (P_1 \lor r_1) \land (q_1 \lor S_1) \end{array} \right\}$ for columns

2. $\dfrac{(P \to Q) \land (Q \to P)}{P \leftrightarrow Q} [\leftrightarrow I]$

3.

$$\dfrac{\dfrac{\dfrac{\overline{A}^4 \quad \neg A}{\bot}[\neg E]}{B}[\neg I]}{A \to B}\,^1{}^4[\to I]$$

$$\dfrac{\dfrac{\dfrac{\overline{C}^3 \quad \neg C}{\bot}[\neg E]}{\neg B}[\neg I]}{C \to \neg B}\,^2{}^3[\to I]$$

$$\dfrac{A \quad C}{A \land C}[\land E] \qquad [\to E]$$

$$\dfrac{\dfrac{B \quad \neg B}{\bot}[\neg E]}{\neg A}[\neg I] \qquad 123\,[\to I]$$

$$(A \to B) \to (C \to \neg B) \to C \to \neg A$$