Homework Assignment #7

Due Time/Date

N/A.

Note

This assignment will not be counted toward your final grade of this course.

Problems

1. (50 %) Prove the partial correctness of the following program using the Owicki-Gries method.

$$
\begin{array}{l}
\{true\} \\
acc := 0; \\
Q_0, Q_1 := false, false; \\
\left[\begin{array}{ll|ll}
Q_0 := true; & & Q_1 := true; \\
T := 0; & & T := 1; \\
\textbf{await } \neg Q_1 \vee (T \neq 0); & \| & \textbf{await } \neg Q_0 \vee (T \neq 1); \\
s_0 := acc; & & s_1 := acc; \\
acc := s_0 + 1; & & acc := s_1 + 1; \\
Q_0 := false; & & Q_1 := false;
\end{array}\right] \\
\{acc = 2\}
\end{array}
$$

2. (20 %) Prove the following derived rule (theorem) in UNITY.

$$\frac{p \mapsto q \vee r \qquad r \mapsto s}{p \mapsto q \vee s}$$

   You may use the following theorem (finite disjunction):

$$\frac{p \mapsto q \qquad p' \mapsto q'}{p \vee p' \mapsto q \vee q'}$$

3. (30 %) If the leads-to operator in UNITY were defined without the disjunction rule, the finite disjunction theorem would still hold.

$$\frac{p \mapsto q \qquad p' \mapsto q'}{p \vee p' \mapsto q \vee q'}$$

   Prove the theorem.

   Hint: First prove, using induction, that

$$\frac{p \mapsto q}{p \vee r \mapsto q \vee r}$$