Assignment 4

Programming Theory

The Bakery Algorithm

\[ a, b, pc_1, pc_2 := 0, 0, T_1, T_2; \]
\[ \text{do} \]
\[ pc_1 = T_1 \rightarrow pc_1, a := W_1, b + 1 \]
\[ pc_1 = W_1 \land (a < b \lor b = 0) \rightarrow pc_1 := C_1 \]
\[ pc_1 = C_1 \rightarrow pc_1, a := T_1, 0 \]
\[ pc_2 = T_2 \rightarrow pc_2, b := W_2, a + 1 \]
\[ pc_2 = W_2 \land (b < a \lor a = 0) \rightarrow pc_2 := C_2 \]
\[ pc_2 = C_2 \rightarrow pc_2, b := T_2, 0 \]
\[ \text{od} \]

Prove that the implementation is correct, in the sense that the program respects the mutual exclusion property.

Hint:

- Find an invariant \( P \).
- Show that \( P \) is an invariant using the invariant theorem.
- Prove that the invariant implies the mutual exclusion property.