CS256-Assignment#8

3 Problems. 80 points.

(In this homework, you can save work by constructing the tableaux incrementally.)

1. [30 points] Problem 5.5. Follow Algorithm P-SAT (p.433).

2. [20 points] Consider the temporal formula $\varphi : \Diamond \Box p \rightarrow q \mathcal{U} r$.

   (a) Construct a tree that describes the steps taken by function $cover_p$ when input φ.

   (b) List the particles returned by $cover_p$.

   (c) Construct a particle tableau for φ.

   (d) Construct the corresponding ω-automaton.

3. [30 points] Consider program ESC:

$$\textbf{local } x : \textbf{ boolean where } x = T$$

$$\left[\begin{array}{l} \ell_0 : \quad \textbf{loop forever do} \\ \qquad\quad [\ \ell_0 : \quad x := T\ ] \end{array} \right] \parallel$$

$$\left[\begin{array}{l} m_0 : \quad \textbf{loop forever do} \\ \qquad\quad [\ m_0 : \quad x := F\ ] \end{array} \right] \parallel$$

$$\left[\begin{array}{l} q_0 : \quad \textbf{loop forever do} \\ \qquad\quad \left[\begin{array}{l} q_0 : \quad \textbf{await } x; \\ q_1 : \quad \textbf{skip} \end{array} \right] \end{array} \right]$$

Is the following property satisfiable over program ESC?

$$\varphi : \Box(x \; \mathcal{U} \; at\_q_1)$$

Assume **loop forever do** does not generate any transition. Compute the behavior graph using particle tableaux to prove satisfiability or unsatisfiability of the property over the given program. You may omit the τ_I edges.

Generate the ω-automaton (give both Muller and Streett acceptance conditions) corresponding to φ, using the particle tableaux.