Intro to Software Verification - Homework 3

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December 17, 2022

Question 1

Question 2

1. True. Let $\pi = s_0 \to s_5 \to s_5$.
   - $M, \pi^2 \models b$
   - $M, \pi^1 \models Xb$
   - $M, \pi^0 \models XXb$
   - $M \models E[XXb]$
2. True. Let π be an arbitrary path in M.
   π must be in the form $s_0 \to v \to *$ where $v \in \{s_1, s_4, s_5\}$.
   We want to prove $M, \pi \models (EXa)U(EXc)$.

   $$((s_0, s_1) \in M) \wedge (s_1 \models a) \Rightarrow s_0 \models EXa \Rightarrow \pi^0 \models EXa$$

   Additionally:

   $$\forall u \in \{s_1, s_4, s_5\}, \exists u' : (u, u') \in M \wedge u' \models c$$
   $$\Rightarrow \forall u \in \{s_1, s_4, s_5\}, u \models EXc$$
   $$\Rightarrow v \models EXc \Rightarrow \pi^1 \models EXc$$
   $$\Rightarrow M, \pi \models (EXa)U(EXc)$$
3. True. Let $\pi = s_0 \to s_4 \to s_7$.
   - $M, \pi^2 \models Gc$
   - $M, \pi^1 \models a$
   - $M, \pi^1 \models aU(Gc)$
   - $M, \pi^0 \models b$
   - $M, \pi^0 \models bU(U(Gc))$
   - $M \models E[bU(U(Gc))]$

4. True. Let $\pi = s_0 \to *$.

   - $s_0 \models b$
   - $s_0 \models cUb$
   - $s_0 \models a(cUb)$
   - $\pi \models a(cUb)$

   $\Rightarrow M \models A[a(cUb)]$

Question 3

Question 4