

Intro to Software Verification - Homework 3

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Question 1

- A. 3
- B. 1
- C. 3
- D. 4
- E. 1

Question 2

1. True. Let $\pi = s_0 \rightarrow s_5 \rightarrow s_5$.

- $M, \pi^2 \models b$
- $M, \pi^1 \models Xb$
- $M, \pi^0 \models XXb$
- $M \models E[XXb]$

2. True. Let π be an arbitrary path in M .
 π must be in the form $s_0 \rightarrow v \rightarrow *$ 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 $\pi = s_0 \rightarrow s_4 \rightarrow s_7$.

- $M, \pi^2 \models Gc$
- $M, \pi^1 \models a$
- $M, \pi^1 \models aU(Gc)$
- $M, \pi^0 \models b$
- $M, \pi^0 \models bU(U(Gc))$
- $M \models E[bU(U(Gc))]$

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

- $s_0 \models b$
 - $s_0 \models cUb$
 - $s_0 \models a(cUb)$
 - $\pi \models a(cUb)$
- $\Rightarrow M \models A[a(cUb)]$

Question 3

Question 4