

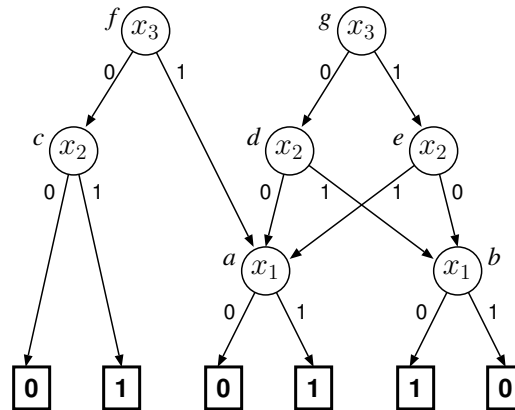
CPRE/SE/COMS 412, COMS 512 HOMEWORK 7

Reminder: present your own work and properly cite any sources used. Solutions should be presented satisfying the *other student viewpoint*. If you need clarification, contact the instructor: asminer@iastate.edu.

Question 1

20 points

For the BDD forest shown below, draw the BDD obtained from the operation $apply(f, \wedge, g)$.



Question 2

20 points

Prove or disprove the following path formula equivalences.

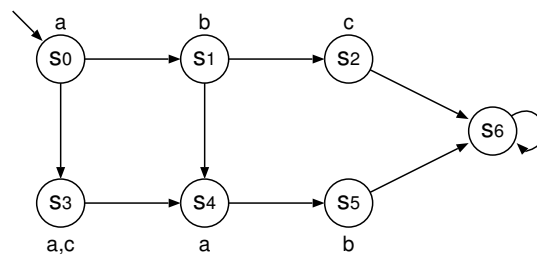
1. $\text{XF } \psi \stackrel{?}{\equiv} \text{FX } \psi$
2. $\text{XG } \psi \stackrel{?}{\equiv} \text{GX } \psi$

Question 3

15 points

For the Kripke structure below,

1. enumerate all possible paths starting from state s_0 , and
2. for each path, determine if the path formula $(a \cup b) \cup c$ is satisfied.



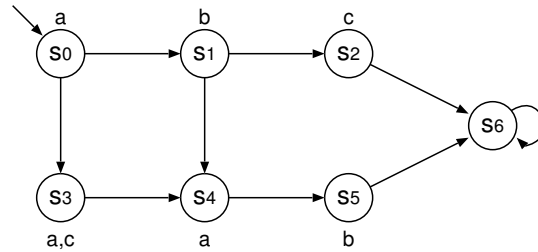
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Question 4 (optional for 412)

20 points

For the Kripke structure below, draw the tableau graph for path formula $\psi = (a \cup b) \cup c$. Using the tableau graph, determine if the model satisfies properties $E\psi$ and $E\neg\psi$.



Question 5 (optional for everyone)

20 points

Consider the CTL formula $\phi = E((Ea \cup b) \cup c)$, and the LTL formula $E\psi$ for path formula $\psi = (a \cup b) \cup c$. Prove or disprove the following.

1. For any Kripke structure M and state s in M , $M, s \models \phi \stackrel{?}{\rightarrow} M, s \models E\psi$
2. For any Kripke structure M and state s in M , $M, s \models E\psi \stackrel{?}{\rightarrow} M, s \models \phi$

Question 6 (optional for everyone)

15 points

Prove or disprove the path formula equivalence:

$$FGF\psi \stackrel{?}{\equiv} GF\psi$$