Concordia University Department of Computer Science and Software Engineering

SOEN 331 - S and U Introduction to Formal Methods for Software Engineering

Assignment 4 - Solutions

Temporal Logic

Team 19 - Section U

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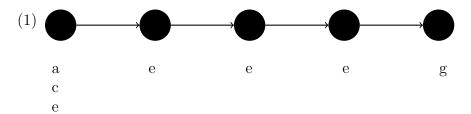
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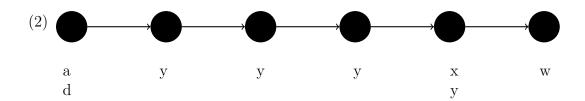
Date: April 19, 2021

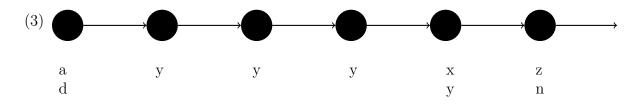
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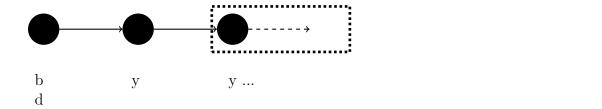
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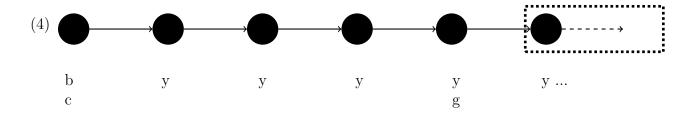
1 Question 1

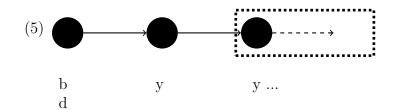


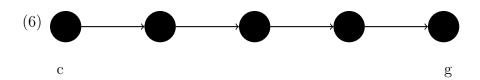


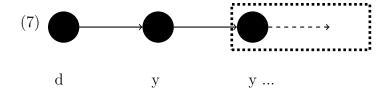








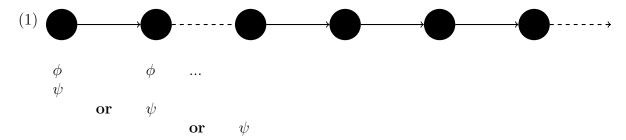




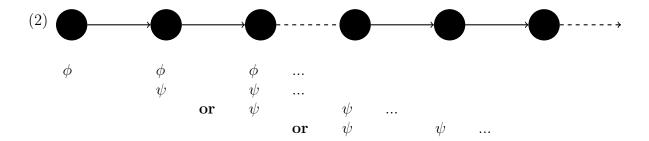
There exists three model's whereby the program terminates, given by the following expressions:

$$\begin{array}{l} <(a\wedge c\wedge e),\ e,\ e,\ e,\ g>\\ <(a\wedge d),\ y,\ y,\ y,\ (x\wedge y),\ w>\\ < c,\ \varnothing,\ \varnothing,\ \varnothing,\ g> \end{array}$$

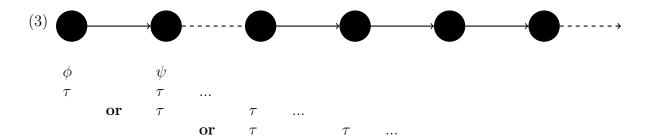
2 Question 2



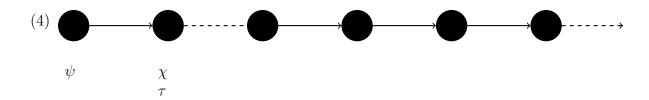
If ϕ is an invariant, then ψ is true in some moment in time.



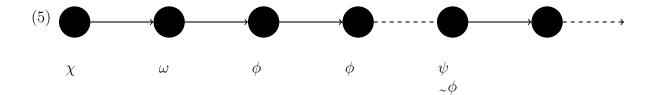
If ϕ is an invariant, then from i+1 onwards, ψ eventually becomes an invariant.



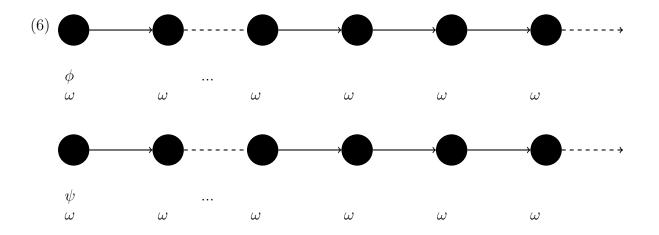
If ϕ is true at i and ψ is true at i+1, then τ can become an invariant anywhere on the path.



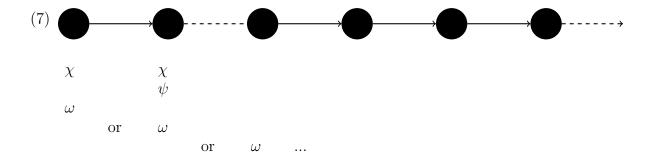
If ψ is true at i and χ is true at i+1, then τ is also true at i+1.



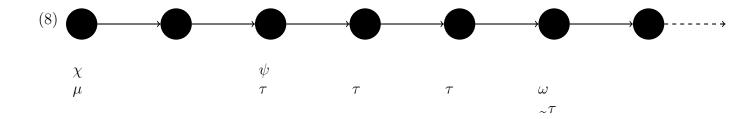
If χ is true at i and ω is true at i+1, then from i+2 onwards, ϕ is true until ψ becomes true.



If only one of the mutually exclusive events ϕ or ψ is true, then ω will always be true.



If χ is true at i and χ & ψ is true at i+1, then ω can emerge anywhere on the path.



If χ is true at i and ψ is true at i+2, then from i+2 onwards, τ is true unless ω becomes true. If μ is true at i, then ω will be true at i+5.