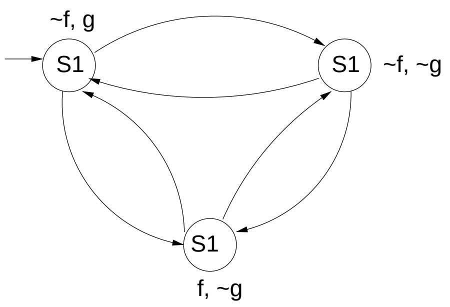
CS615 Autumn 2004 Quiz 3

Time: 90 mins Total marks: 30

- ***The exam is open book and notes.***
- ***Results/proofs covered in class/problem sessions/assignments may simply be cited, unless specifically asked for.***
- ***Unnecessarily lengthy solutions will be penalized.***
- ***If you need to make any assumptions, state them clearly.***
- ***Do not copy solutions from others or indulge in unfair means.***

1. *[10 + 10 marks]* Let ϕ be the LTL formula $f \rightarrow \mathbf{F}\neg g$, where f and g are atomic propositions.
   (a) Construct the closure of ϕ, as used in tableau construction.
   (b) Construct the tableau for $\neg\phi$. Instead of drawing edges between states, you may simply indicate by means of an adjacency list which states have edges to which other states.

2. *[10 marks]* Consider the Kripke structure shown in Fig. 2, where f and g are atomic propositions. Using the explicit state model checking algorithm for CTL, label the states of this Kripke structure with the subformulas of $\psi = \mathbf{AG}(f \rightarrow EF\neg g)$. Each state must be labeled with all the subformulae true in that state.



You must clearly show the following steps of your approach:

- Conversion of ψ to a form containing only $\mathbf{EG}$, $\mathbf{EF}$, $\mathbf{EX}$, $\vee$ and $\neg$.
- Constructing the set of subformulae in which only the above operators are present.
- Labeling states with the above subformulae according to the explicit model checking algorithm, in increasing order of nesting of operators.