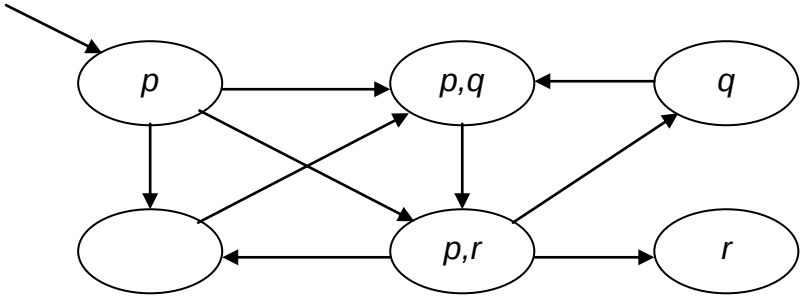
Formal Model and Verification

Exercise 7: Symbolic safety analysis analysis

1. We have the following Kripke structure *M* with proposition set {*p*,*q*,*r*}. We only put down the proposition names that are true at states.



Please construct a propositional logic formula that describes the states of *M*.

2. For the Kripke structure *M* in question 1, please construct a propositional logic formula of variables {*p*,*q*,*r*,*p*',*q*',*r*'} that describes the transition relation of *M*.

3. For the Kripke structure M in question 1, please use the symbolic least fixpoint algorithm to construct a propositional formula that characterizes states satisfying $\exists\Diamond q$. According to the formula you constructed, please tell me whether the initial state satisfies $\exists\Diamond q$?

4. For the Kripke structure M in question 1, please now treat $\exists\Diamond q$ as an atomic proposition and use the symbolic least fixpoint algorithm to construct a propositional formula that characterizes states satisfying $\exists\Diamond(\neg\exists\Diamond q)$. According to the formula you constructed, please tell me whether the initial state satisfies $\exists\Diamond(\neg\exists\Diamond q)$?