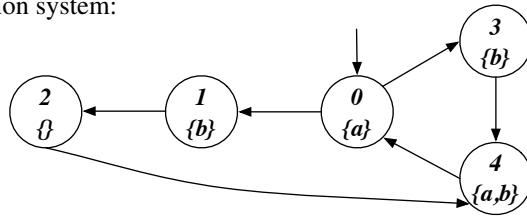
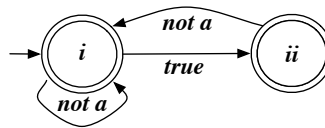


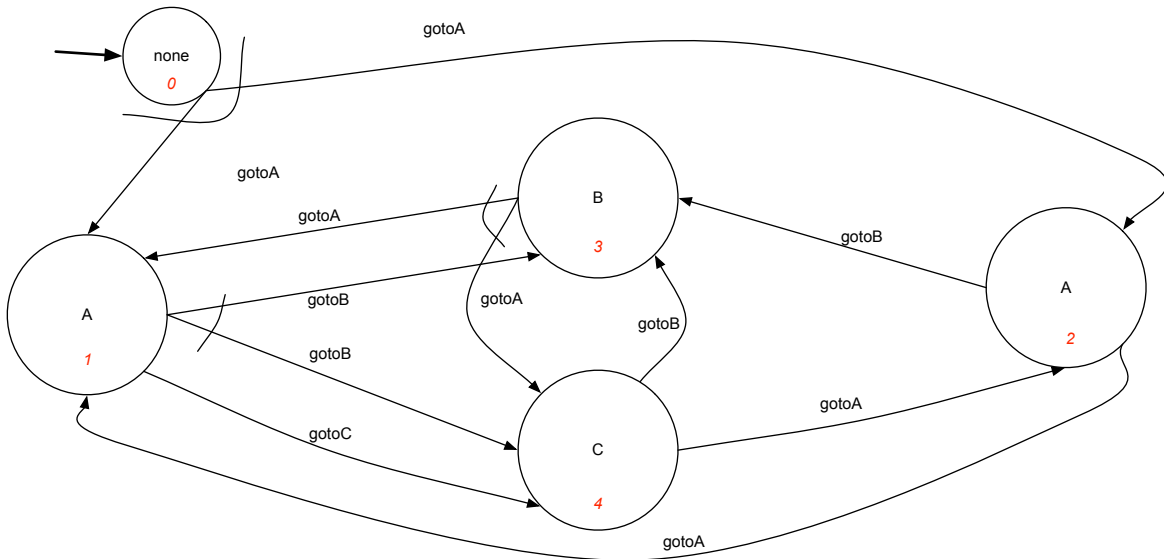
Part 1. Consider the following transition system:



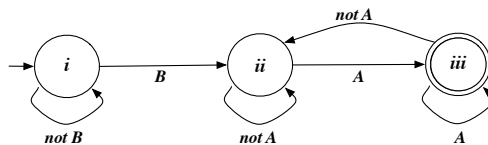
- **Exercise 1.1:** Model check the CTL formula $AG(EG(AFa \vee EFb))$ by translating it in Mu-Calculus.
- **Exercise 1.2:** Model check the LTL formula $\diamond(a \wedge \bigcirc a)$, by considering that the Büchi automaton for $\neg \diamond(a \wedge \bigcirc a)$ is:



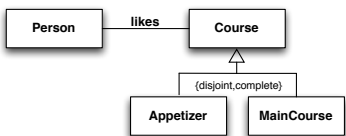
Part 2. Consider the following domain:



Synthesize a strategy for realizing the LTLf formula $\diamond(B \wedge \bigcirc \diamond(A \wedge \bullet false))$ by considering that the corresponding DFA is:



Part 3. Consider the following simple UML class diagram, and express in FOL the following boolean queries stating which ones are CQs (do not use abbreviations for cardinalities):



1. Return persons who like an appetizer and a main course.
2. Check if there exists a person who likes two appetizers and a main course.
3. Check if there exists a person who likes exactly one appetizer.
4. Return persons who like all appetizers.
5. Return persons who likes only appetizers.
6. Check if there is a pair of persons such that the first likes all appetizers that the second likes.