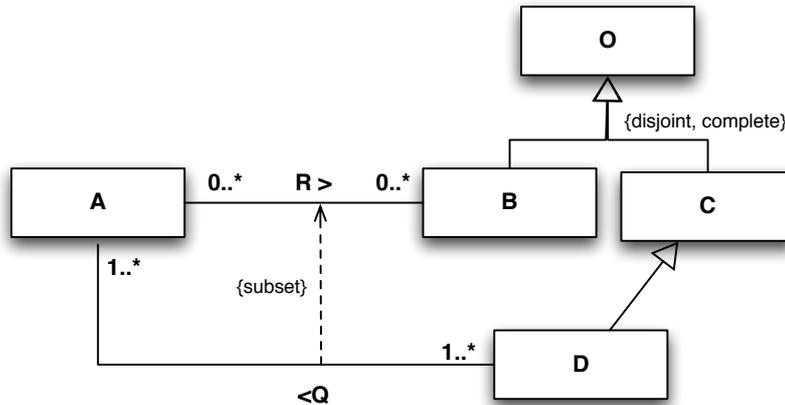
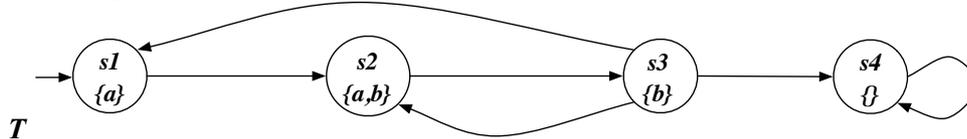


1. Consider the following UML class diagram.



- i. Express it in FOL.
- ii. Express it in ALCQI or SHIQ.
- iii. Express it in DL-lite_A, highlighting parts that are not expressible.
- iv. Check whether the resulting DL-lite_A TBox is consistent with the ABox {D(d)}. Recall that to do this check one has to verify that the boolean conjunctive query $q() :- B(x), C(x)$ returns *false*.

2. Consider the following transition system:



Model check the following formulas:

$$\nu X. \mu Y. ((a \wedge \langle next \rangle X) \vee \langle next \rangle Y)$$

$$AG(b \rightarrow EXa)$$

3. Check using tableaux whether the following ALC subsumption holds, and if not show a counterexample:

$$\exists R. (\exists R. A \sqcap \exists R. B) \sqsubseteq \forall R. (\exists R. A)$$

4. Compute the weakest precondition for getting $\{x=y\}$ executing the following program:

```
x:=10;
if (y>1) then
  x:=x-y;
else (x := x-y;
      x := y-1)
```

5. Check whether CQ q_1 is contained in CQ q_2 below, reporting canonical DBs and homomorphism:

$$q_1(x) :- e(x, x)$$

$$q_2(x) :- e(x, y), e(y, z), e(x, y)$$