

(A) For each of the following DL concepts, use the tableau algorithm to determine whether it is satisfiable, and in the case it is, construct a satisfying interpretation:

1. $\neg(\forall R.A \sqcup \exists R.(\neg A \sqcap \neg B))$
2. $\exists R.(\forall S.C) \sqcap \forall R.(\exists S.\neg C)$
3. $(\exists S.C \sqcap \exists S.D) \sqcap \forall S.(\neg C \sqcup \neg D)$
4. $\exists S.(C \sqcap D) \sqcap (\forall S.\neg C \sqcup \exists S.\neg D)$
5. $C \sqcap \exists R.A \sqcap \exists R.B \sqcap \neg \exists R.(A \sqcap B)$

(B) Use the tableau algorithm to decide whether the following subsumption is true in all interpretations:

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