## Exercises – Semantic Tableaux Method

**Exercise 1**

Using the semantic tableaux method decide what kind (consistent, inconsistent, valid) of formula is .

If  is consistent, find all its models.

1.;

2.;

3.;

4.;

5.;

6.;

7.;

**Exercise 2**

Prove that the following formulas are tautologies using the semantic tableaux method:

1.distribution of ’’ over ’’: ;

2.separation of the premises law: ;

3.distribution of ’’ over ’’: ;

4.distribution of ’’ over ’’: ;

5.reunion of the premises law: ;

6.distribution of implication:;

7.distribution of ’’ over ’’: .

8.permutation of the premises law:;

**Exercise 3**

Using the semantic tableaux method, decide whether the following logical consequences hold or not.

If a logical consequence does not hold find an anti-model of it.

1.

2.

3.

4.

5.

6.

7.

8.

**Exercise 4**

Write all the anti-models of the propositional formulas  using the semantic tableaux method.

1.;

2.;

3.;

4.;

5.;

6.;

7.;

**Exercise 5**

Using the semantic tableaux method, prove the following properties in predicate logic:

1.’’ is semi-distributive over ’’:

 and



2.’’ is semi-distributive over ’’:

 and



3.’’ is semi-distributive over ’’:

 and



4.’’ is semi-distributive over ’’ :

 and



5.and



6.’’ is distributive over ’’



7.’’ is distributive over ’’



8.

**Exercise 6**

Using the semantic tableaux method check whether the following logical consequences hold.

1.;

2.

3.;

4.;

5.;

6.;

7.;

8..

Exercise 7. Succession to the British throne

*Hypotheses*:

. If  is the king and  is his oldest son, then  can become the king.

. If  is the king and  defeats , then  will become the king.

.  is the king.

. defeated .

.  is ’s oldest son.

*Conclusion*:

. Can  become the king?

Check whether the conclusion  is a logical consequence of the set of hypotheses {}

using the semantic tableaux method. 

**Exercise 8.**

Consider the following set of *hypotheses*  and check the validity of the *conclusion* () based on the validity of the hypotheses. . Apply the semantic tableaux method.

. Every child loves *Santa*.

. Everyone who loves *Santa* loves any reindeer.

. *Rudolph* is a reindeer, and *Rudolph* has a red nose.

. Anything which has a red nose is weird or is a clown.

. No reindeer is a clown.

. *Scrooge* does not love anything which is weird.

. *Scrooge* is not a child.

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