Result:

NEPTUN ID: ...... ☐☐☐☐☐☐ Number of draft papers: ☐

Name: ....

Training: ....

IMPORTANT! The test contains 1 pages. The available time is 90 minutes. A successful exam will have at least 60 percent. Please indicate your NEPTUN ID on your draft pages too! You have to use blue ball pen to fill the test, the use of other tools is forbidden! The room is video-monitored.

1. Put back the parentheses! (1 point)

    (a) $\neg s \vee \neg\neg t$

    (b) $s \wedge \neg t \supset r$

2. Determine the following properties! (2 point)

    (a) Direct subformulas,

    (b) set of subformulas,

    (c) cosntruction tree.

$$\left(\neg\left(s \wedge \neg t\right) \supset \left(r \vee \neg s\right)\right)$$

3. Evaluate the expressions! (2 point)

$$\rho(s) = 1, \quad \rho(t) = 0, \quad \rho(r) = 0, \quad \rho(q) = 0$$

    (a) $\left|\left(s \supset \neg t\right) \supset \neg\left(t \supset r\right)\right|_\rho$

    (b) $\left|\neg\left(\neg\left(s \supset t \vee r\right) \wedge q \supset r\right)\right|_\rho$

4. Proove or disprove that the following formula is valid! (3 point)

$$\neg s \supset \left(t \supset \left(r \supset \neg s\right)\right)$$

5. Proove or disprove, that the following formulas are logically equivalent! (3 point)

$$s \vee t \supset r \Leftrightarrow \left(\neg s \wedge \neg t\right) \vee r$$

6. Proove or disprove, that the $\neg q \supset r$ formula is a logical consequence of the formulas below! (3 point)

$$\left(s \vee \neg t\right) \wedge \left(r \supset q\right) \qquad \neg\left(t \vee r \supset s \vee p\right)$$

7. Create conjunctive (CNF) and disjunctive (DNF) normal forms! (4 point)

    (a) $\left(s \vee \neg t\right) \wedge \left(s \supset q\right)$,

    (b) $\neg\left(t \vee r \supset s \vee r\right)$.