Univerza na Primorskem, FAMNIT: TOR I
Študijsko leto 2016/2017

Kolokvij 1

21. november 2016

IME IN PRIIMEK: _____ VPISNA ŠT.: | | | | | | | | |

ŠTUDIJSKI PROGRAM: _____ LETNIK: _____

1. Let A, B and C be arbitrary logical statements. Consider the following logical statement.

$$\mathcal{I} = (A \Rightarrow (B \Rightarrow C)) \Leftrightarrow ((A \wedge B) \Rightarrow C)$$

(a) (10 točk) Construct the truth table for $\mathcal{I}$.

(b) (10 točk) Write down the canonical disjuntive and conjuctive forms for the negation of $\mathcal{I}$

(c) (5 točk) Draw the circuit for $\mathcal{I}$.

2. For each statement, write down its negation. Consider $x \in \mathbb{R}$ (x is a real number)

(a) (4 točk) $(\forall x)(x \in S \Rightarrow x \neq 3)$

(b) (4 točk) $(\exists x)(x > 2 \Rightarrow (\forall y)(y > 2 \Rightarrow x + y < 0))$

(c) (4 točk) $(\exists! x)(x \leq 4 \vee x > -1)$.

3. (15 točk) Without additional assumptions check the correctness of the following logical deduction (sklepa) and explain your answer.
If Janez wins the competition then either Miha is second or Robert is third.
Miha did not win.

Deduction: If Miha was not second then Janez did not win.

4. Determine whether the following statements are true or false.

(a) (4 points) If the consequence is a contradiction (protislovje), then the antecedent (antecedens) must be a tautology. DA NE

(b) (4 points) A Logical statement which implies its own negation must be a contradiction. DA NE

(c) (4 points) $A \Rightarrow A \vee B$ DA NE

(d) (4 points) We can construct 2^n logical statements from n atomic statements. DA NE

5. Are the following implications correct?

(a) (4 points) $(A \Rightarrow B) \Rightarrow (A \vee C \Rightarrow B \vee C)$

(b) (4 points) $(A \Rightarrow B \wedge C) \Rightarrow (A \Rightarrow C)$

(c) (4 points) $(A \Leftrightarrow B) \Rightarrow (\neq A \vee B) \wedge (A \vee \neq B)$

6. (15 points) Prove the following logical implication $(A \Rightarrow B) \Rightarrow ((C \Rightarrow A) \Rightarrow (C \Rightarrow B))$ without a truth table.

7. (8 points) For every fo the following sets

$$\emptyset,\ \{\emptyset\},\ \{1\},\ \{1, \{\emptyset\}\},\ \{\{1\}\},\ \{1, \{1\}\}$$

determine whether it is an element or subset of the set

$$\{\emptyset, 1, \{1, \emptyset\}, \{\{1\}\}\}$$

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8. (8 points) Write down the logical statement for th following circuits.