Assignment 2

Due: Thu. Jan. 30, 2014

Question 1 (10%)
Let $A$, $B$, and $C$ be propositional wffs. Write a wff whose meaning is “if $A$ then $B$ else $C$.”

Question 2 (15%)
Use truth tables to verify the following equivalences:

1. $(P \rightarrow Q) \equiv (\neg P \lor Q)$
2. $(P \land Q) \equiv (\neg P \lor \neg Q)$
3. $A \lor (A \land B) \equiv A$

Question 3 (10%)
Show that $\rightarrow$ is not associative. That is, $(A \rightarrow B) \rightarrow C$ is not equivalent to $A \rightarrow (B \rightarrow C)$.

Question 4 (15%)
Use Quine’s method to show each wff below is a contingency.

4.d) $(A \rightarrow B) \land (B \rightarrow \neg A) \rightarrow A$
4.e) $(A \rightarrow B) \land (B \rightarrow C) \rightarrow (C \rightarrow A)$
4.f) $(A \lor B) \rightarrow (C \lor A) \land (\neg C \lor B)$

Question 5 (10%)
Is the following wff a tautology? Why?

$$A \land (A \rightarrow B) \rightarrow B$$

Question 6 (15%)
Transform each of the following wff into a DNF. SHOW YOUR WORK.

6.g) $Q \land \neg P \rightarrow P$
6.h) $(P \lor Q) \land R$
6.i) $(A \lor B) \rightarrow (C \lor D)$

Question 7 (10%)
Transform each of the following wff into a full DNF. SHOW YOUR WORK.

7.j) $P \rightarrow Q \land R$
7.k) $(A \lor B) \land (A \lor C)$

Question 8 (5%)
Transform each of the following wff into a full CNF. SHOW YOUR WORK.

8.l) $P \rightarrow Q \land R$

Question 9 (10%)
Show that \{ NAND \} is a complete set of connectives.