Theoretical Computer Science (Bridging Course)

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Exercise Sheet 11

Due: 29th January 2015

Exercise 11.1 (CNF, DNF)

(a) Convert $\phi := \neg(p \to q) \vee ((r \vee s) \to (q \vee t)) \vee (\neg p \to \neg v)$ into Conjunctive Normal Form.

(b) Convert $\phi := \bigvee_{i=1}^{n} (p_i \leftrightarrow q_i)$ into Disjunctive Normal Form.

Exercise 11.2 (Derivation, 3 marks)
Give a derivation of $\phi = B \wedge C$ from the knowledge base

$$KB = \{A, B, A \vee C, K \wedge E \leftrightarrow A \wedge B, \neg C \to D, E \vee F \to \neg D\},$$

using the inference rules for propositional logic.

Exercise 11.3 (Contradiction Theorem)
Prove the contradiction theorem: $KB \cup \{\varphi\}$ is unsatisfiable iff $KB \models \neg\varphi$.
Hint: *Deduction Theorem* can be useful here.