Lógica en la Informática / Logic in Computer Science

Wednesday April 27th, 2016

Time: 1h45min. No books, lecture notes or formula sheets allowed.

1) Given two propositional formulas F and G, is it true that $F \to G$ is a tautology iff $F \models G$? Prove it using only the formal definitions of propositional logic.

2) Let F be a formula. Is it true that F is satisfiable if, and only if, all logical consequences of F are satisfiable formulas? Prove it using only the formal definitions of propositional logic.

3) What is Horn-SAT? What is its computational complexity? Explain very briefly why.

4) Consider the following decision problem, called "MaxSAT":
Input: A natural number k and a set S of n propositional clauses over propositional symbols $\mathcal{P}$.
Question: Is there any interpretation $I : \mathcal{P} \to \{0, 1\}$ that satisfies at least k clauses of S?

4a) Do you think that MaxSAT is polynomial? NP-complete? Exponential? Why?

4b) How would you use a SAT solver to decide it?

4c) How would you use a SAT solver to solve the optimization version of MaxSAT, that is, how to find the I that satisfies as many of the clauses of S as possible?