CSC281: Discrete Math for Computer Science

Computer Science Department   First Semester 1442

King Saud University   Tutorial 1: Propositional and Predicate Logic

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Question 1. Find a proposition for the given truth table:

p	q	....
T	T	F
T	F	F
F	T	T
F	F	F

Question 2.

1. Write a proposition with three variables, which is true iff only one variable is true, and false otherwise.

2. Write a proposition with three variables, which is never true (unsatisfiable).

Question 3. Determine whether $p \to (q \to r)$ and $(p \to q) \to r$ are equivalent.

Question 4. Determine whether the following propositions are tautologies, if yes, proof them using propositional equivalences:

1. $(q \land (p \to \neg q)) \to \neg p$

2. $((p \to q) \land \neg p) \to \neg q$

Question 5. Write a proposition equivalent to $p \lor \neg q$ that uses only $p, q, \neg$, and the connective $\land$.

Question 6. Let the variable x represent students and y represent courses, with: F(x): x is a freshman, A(x): x is a part-time student, and T(x,y): x is taking y. Translate these statements into English:

1. $\exists x (A(x) \land \neg F(x))$

2. $\forall x \; \exists y \; T(x, y)$

3. $\exists x \; \forall y \; T(x, y)$

Question 7. Let $p(m, n)$ mean $m \leq n$, where n and m are non-negative integers. Determine whether the following statements are true:

1. $\forall n \; p(0, n)$

2. $\exists n \; \forall m \; p(m, n)$

3. $\forall m \; \exists n \; p(m, n)$

Question 8. Let the variable x denote people, and S(x): x is smart, T(x): x is tall, and W(x): x is worried. Write these statements using the given predicates and any needed quantifiers:

1. Some people are not worried.

2.All tall people are smart.

3.No smart people are worried.

4.Some people are tall and smart, but they are worried.

5.If a person is smart, then that person is not worried.