

Solutions of Tutorial XII

Discrete Structures (CS21001)

Autumn Semester 2014

November 12, 2014

1. Construct the separate truth tables for $(p \leftrightarrow q)$ and $(r \leftrightarrow s)$ and combine.
2. (a) Converse: I'll ski tomorrow only if snows today.
Contrapositive: If I do not ski tomorrow, then it will not have snowed today.
Inverse: If it does not snow today, then I'll not ski tomorrow.

(b) Converse: If I come to class, then there will be quiz.
Contrapositive: If I do not come to class, then there will not be a quiz.
Inverse: If there is not going to be quiz, then I do not come to class.

(c) Converse: A positive integer is a prime if it has no divisor except 1 and itself.
Contrapositive: If a positive integer has a divisor other than 1 and itself, then it is not a prime.
Inverse: If a positive integer is not a prime, then it has a divisor other than 1 and itself.
3. $\neg (p \vee (\neg p \wedge q))$
 $\equiv \neg p \wedge \neg (\neg p \wedge q)$
 $\equiv \neg p \wedge (p \vee \neg q)$
 $\equiv (\neg p \wedge p) \vee (\neg p \wedge \neg q)$
 $\equiv (\neg p \wedge \neg q)$
4. (a) Every comedian is funny.
(b) Some comedian is funny.
5. Let $P(w, f)$ is "w has taken f" and $Q(f, a)$ is "f is a flight on a".
 $\exists w \forall a \exists f (P(w, f) \wedge Q(f, a))$
6. Suppose that p_1, p_2, \dots, p_n is true. We want to prove $q \rightarrow r$ is true. If q is false then we are done vacuously. Otherwise q is true, then by the validity of the given argument (that p_1, p_2, \dots, p_n, q are true then r must be true), we know that r is true.