



# Ch1.2 Applications of Propositional Logic (Week 10)

## System Specification

▼ Example 4

Determine whether these system specifications are consistent:

"The diagnostic message is stored in the buffer or it is retransmitted."

"The diagnostic message is not stored in the buffer."

"If the diagnostic message is stored in the buffer, then it is retransmitted."

1. Logical expression

$p$  is "The diagnostic message is stored in the buffer",  $q$  is "The diagnostic message is retransmitted."

$\Rightarrow p \vee q, \neg p, p \rightarrow q$

For all three to be true: (1) if  $\neg p$  is true, then  $p$  is false (2) if  $p \vee q$  is true and  $p$  is false, then  $q$  is true (3)  $p \rightarrow q$  with  $F \rightarrow T$  is true

All three are true, hence consistent.

2. Truth table

Using a truth table to examine the four possible truth values of  $p$  and  $q$ .

## Boolean Searches

- searches in large collections of information, such as indexes of Web pages
- using the connectives AND, OR, and NOT

## Logic Puzzles

▼ Example 7

$A$  says " $B$  is a knight", and  $B$  says "The two of us are opposite types"

Knight - who always tell the truth; Knaves - who always lie.

(1)  $A$  is a knight ( $p$ )

If  $A$  is true, then  $B$  is a knight so that  $q$  is true, and  $A$  and  $B$  are the same type.

However, if  $B$  is a knight, then  $q$  should be true (opposite types),  $(p \wedge \neg q) \vee (\neg p \wedge q)$  would have to be true, which it is not.

(2)  $A$  is a knave ( $\neg p$ )

If  $A$  is false, then  $B$  is not a knight but a knave.

If  $B$  is a knave, then  $q$  should be false (same type), which is consistent.

Hence, both  $A$  and  $B$  are knaves.

## Logic Circuits

- receives input signals (0 or 1, as off or on), produces output signals

