CMSC 250 Homework 1 Spring 2009

Due Wed Feb 10 at the beginning of your discussion section.

Solutions must be neat and clear with all sheets stapled together.

1. Convert the following sentences to logical expressions assuming “a”, “b”, “c” represent the propositions below. You may assume Alex, Justin, and Rebecca are the only people we are discussing.

   • a = Alex plays the trumpet.
   • b = Justin plays the trumpet.
   • c = Rebecca plays the trumpet.

(a) Alex plays the trumpet, but Justin cannot.
(b) Someone can play the trumpet.
(c) At least two of them plays the trumpet, but not all three.

2. Construct the complete truth table for each of the following:

   (a) \((a \lor b) \land \sim c\)
   (b) \((p \land q) \rightarrow (\sim p \lor r)\).
   (c) \((a \leftrightarrow b) \lor (a \land \sim b)\)

3. Give negations of the following statements using DeMorgan’s laws. Keep it in English.

   (a) Alex plays the trumpet, but Justin cannot.
   (b) Either Alex plays the trumpet or Rebecca plays the trumpet.
   (c) An orchestra must have a French horn player or a violin player. (or possibly both).

4. Use a truth table to determine if the following argument is valid or not. State whether or not it is valid, and give your reasons why it is valid or not.

\[
\begin{array}{c|c|c|c|}
P1 & p \lor q & (p \land q) \rightarrow q & q \lor r \\
P2 & \hline \\
\text{Therefore} & & & \\
\end{array}
\]
