CS245 Assignment 1 (Due Feb 2, 2010)

January 21, 2010

1. Which of these are propositions? What are the truth values of these propositions?
   1) Do not pass go.
   2) There are no black flies in Maine.
   3) $4 + x = 5$
   4) $x + y = y + z$ if $x = z$

2. Let $p$ and $q$ two propositions
   $p$: I bought a lottery ticket this week.
   $q$: I won the million dollar jackpot on Friday.

Express each of these propositions in English sentence.
   1) $p \land q$
   2) $\neg q \rightarrow p$
   3) $\neg p \lor (p \land q)$

3. Let $p$, $q$ and $r$ are propositions:
   $p$: You have the flu.
   $q$: You miss the final.
   $r$: You pass the course.

Express each of these propositions in English sentence.
   1) $p \rightarrow q$
   2) $\neg q \rightarrow r$
   3) $(p \rightarrow \neg r) \lor (q \rightarrow \neg r)$
   4) $(p \land q) \lor (\neg q \land r)$

4. Let $p$, $q$ and $r$ are propositions:
   $p$: You get an A on the final exam.
   $q$: You do every exercise in the book.
   $r$: You get an A for the class.

Write these propositions using $p$, $q$, $r$ and logic connectives.
1) You get an A on the final, but you don’t do every exercise in the book; nevertheless, you got an A in the class.
2) Getting an A on the final and doing every exercise in the book is sufficient for you to get an A for the class.
3) You will get an A for the class if and only if you either do every exercise in the book or you get an A in the final.

5. Construct a truth table for \((p \oplus q) \land (p \oplus \neg q)\).

6. Show \((p \rightarrow q) \land (p \rightarrow r)\) and \(p \rightarrow (q \land r)\) are equivalent.

7. Five friends have access to a chat room. Is it possible to determine who is chatting if the following information is true? Either Kevin or Heather, or both are chatting. Either Randy or Vijay, but not both are chatting. If Abby is chatting, so it Randy. Vijay and Kevin are either both chatting or neither is. If Heather is chatting, so are Abby and Kevin. Explain your reasoning. [Hint: Express each statement using logic variables. You can use \(r\) to indicate Randy is chatting, \(v\) for Vijay chatting, and so on. Your goal is to find a truth value assignment to these logic variables such that all the conditions follow (are true).]