CS/Math 240: Intro to Discrete Math 2/8/2011

Grading Key for Homework 1

Instructor: Dieter van Melkebeek

Problem 1 (10 points)

Each subdivision carries 2 points where

- 1/2 point for writing the propositions symbolically
- 1/2 point for stating whether it is the converse or the contrapositive of the proposition, or neither
- 1/2 point for stating whether it is equivalent to the proposition or not
- 1/2 point for the argument

Problem 2 (8 points)

For subdivisions (a) and (b),

- 1 point for the equivalent form
- 1 point for proving equivalence
- 1 point for arguing minimality

For subdivision (c),

- 1 point for the equivalent form
- 1 point for proving equivalence

Problem 3 (4 points)

Each subdivision carries 2 points

- 1 point for each proposition
  - 1/2 point for stating whether it holds or not
  - 1/2 point for a brief explanation

Problem 4 (10) points

1 point for each subdivision

Problem 5 (8 points)

4 points for each subdivision

- 2 points for answering correctly / Supplying an example of a satisfying assignment
- 2 points for explaining how to come to the correct answerEach subdivision carries 2 points where

Common Mistakes

- Problem 1
  - For the compound propositions first you are required to represent them in the form of elementary propositions.
  - It is not sufficient if you state if it equivalent or not to the original proposition. You should also prove/disprove their equivalence by suitable methods.
- Problem 2
  - If asked to reduce any expression see to it the final expression cannot be reduced further. Example : $(P \wedge Q) \vee (P \wedge R) \vee (Q \wedge R)$ could be further reduced to $(P \wedge (Q \vee R)) \vee (Q \wedge R)$.
- Problem 4
  - 4a : "All students attending the meeting" shouldn't be written as – $(\forall x \in D)(S(x) \wedge A(x))$. This is incorrect because this representation implies that – for each x, x is a student and x attended the meeting. In other words, everyone is a student and everyone attended the meeting which is not what the given statement means.

  - 4c : For this statement, the final symbolic representation should not be written as $(\exists x)(S(x) \wedge ((\forall y)(A(y) \wedge K(x,y))))$ because this would mean that everyone attended the meeting and there is some student who knows everyone. This is different from the original sentence that says there is ome student who knows everyone attending the meeting.

  - 4g : This should not be written as $A(Alice) \wedge A(Bob) \wedge (\forall x)\,(S(x) \wedge \neg K(Alice, x) \wedge \neg K(Bob, x))$. This is for the same reason as above. The $\wedge$ symbol would change the sentences meaning into this : 'Everyone is a student and Alice and Bob doesn't know anybody' which if you notice is not equivalent to 'Alice and Bob does not know any student'. The conversion of the $\wedge$ to a $\Rightarrow$ would give what we wanted.
- Problem 5
  - Merely stating whether a given statement is true or false would not suffice. You would have to prove by using truth table and drawing conclusions or through a sequence of logical statements for such problems.