Discrete Structure

Practice Midterm Exam

Fall 2015

Name:

Problem (1) (6 points)

a. Construct a truth table for these compound proposition.
   1. $(p \oplus q) \rightarrow (p \oplus \neg q)$

   2. $((p \rightarrow q) \rightarrow r) \rightarrow s$

b. Evaluate each of these expressions.

   1. (1 1 0 11 ∨ 01010) ∧(1 0001∨11011)

   2. (01010 ⊕ 11011) ⊕ 01000

Problem (2) (5 points)

a. Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology.

b. Show that $\neg p \leftrightarrow q$ and $p \leftrightarrow \neg q$ are logically equivalent.

Problem (3) (3 points)

a. Express the negation of the following statement so that negation symbol immediately precede predicates.

   $\forall x \exists y \ \forall z \ T(x,y,z)$

b. Determine the truth value of each of these statements if the domain for all variables consists of all integers.

   $\exists n \forall m \ (n < m^2)$

Problem (4) (3 points)

Determine whether the argument is valid. If it is correct, what rule of inference is being used? If it is not, what logical error occurs?

If n is a real number with $n > 2$, then $n^2 > 4$.
Suppose that $n \leq 2$. Then $n^2 \leq 4$.

Problem (5) (2 points)

Use rules of inference to show that if $\forall x\ (P(x) \rightarrow (Q(x) \land S(x)))$ and $\forall x\ ((P(x) \land R(x))$ are true, then $\forall x\ (R(x) \land S(x))$ is true.

Problem (6) (2 points)

Use a direct proof to show that every odd integer is the difference of two squares.

Problem (7) (2 points)

a. Let A={a,b,c,d} and B={y,z} find AXB

b. Find the power set of {a,b}

Problem (8) (2 points)

Let A={a,b,c,d,e} and B= {a,b,c,d,e,f,g,h} find :

a. A - B

b. A ∩ B