

CSE 20 Spring 2009
Exam 1

35 minutes

1. Let

r = she registered to vote

v = she voted

Write the following statements in symbolic form, using the variables r and v , and the logical operators $\sim$ (not), $\wedge$ (and), and $\vee$ (or).

a) she registered to vote but she did not vote

b) she did not register to vote but she voted anyway

2. Is the function

$$\sim (p \vee \sim q) \vee (\sim p \wedge \sim q)$$

equal to the function $\sim p$? _____

Prove your answer by constructing a (truth) table which includes a column for each of the two functions/expressions. In the table use extra columns for intermediate steps.

3. We studied a method for translating a (truth) table into an equivalent Boolean expression. We did this by constructing an expression for certain rows, and then combining them.

Use the rules to construct a logical expression for the following table, where p and q are the "inputs" and r is the "output". (Show your work.)

p	q	r
0	0	1
0	1	0
1	0	0
1	1	1

4. Convert 1011011111000101_2 from binary to hexadecimal

5. Find the 8-bit binary representation of 108_{10} . Show your work

6. Construct the 2's complement of the following binary number

00111100_2 .

7. Use a table to show that the following two circuits represent the same Boolean function. Do this in two steps.

Step 1) What are the two logical expressions that correspond to these two circuits?

Step 2) Construct a truth table with a column for each of the two expressions

8. Show that the expression

$$p \vee (p \wedge q) = p$$

follows from the distributive rule, the idempotent rule, and the (conjunctive) absorption rule. Transform the expression on the left, using these rules, to arrive at the expression on the right. Name the rule that you are using.