

MAT 115: Finite Math for Computer Science

Problem Set 1

Due: 09/14/2016

Instructions:

I leave plenty of space on each page for your computation. If you need more sheet, please attach your work right behind the corresponding problem. If your answer is incorrect but you show the computation process, then partial credits will be given. Please staple your solution and use the space wisely.

First Name:

Last Name:

Group ID:

Score: /

Problem 1 Truth Table

Make a truth table for $(p \wedge (\sim p \vee q)) \wedge \sim (q \vee \sim r)$

Problem 2 Proof: Algebraic Rules for Boolean Functions

Show that $p \vee (q \wedge r) = (p \vee q) \wedge (p \vee r)$ by using truth table

Problem 3 Proof: Algebraic Rules for Boolean Functions

Problem 1.13 on BF-8

Problem 4 Proof: Algebraic Rules for Boolean Functions

Problem 1.11 on BF-8

Problem 5 Proof: Algebraic Rules for Boolean Functions

Problem 1.8 on BF-8

Problem 6 Boolean Functions

Given a function $f : \{0, 1\}^5 \rightarrow \{0, 1\}$, please answer the following :

(a) Please show two input instances from the domain.

(b) How many elements are there in the codomain?

(c) What is the number of possible boolean functions f ?

(d) Boolean functions can be found in many applied problems. Please briefly describe a problem (search on wikipedia) that is a direct application of boolean function and explain why this problem is important.

Problem 7 Base Change

Convert the following numbers

(a) EB0A (hex number into decimal form)

(b) 1001011 ((ternary number into decimal form)

(c) 2016 (base 7 number to decimal number)

(d) 345 (decimal number into ternary form)

Problem 8 Representing Function

Given $f : \{0, 1\}^3 \rightarrow \{0, 1\}$, we can easily interpret it as $f(p, q, r) = s$ where $p, q, r \in \{0, 1\}$ and $s \in \{0, 1\}$. If we have $f(0, 0, 0) = 1, f(0, 1, 0) = 1, f(1, 0, 0) = 0, f(1, 1, 0) = 1, f(0, 0, 1) = 1, f(0, 1, 1) = 1, f(1, 0, 1) = 0$ and $f(1, 1, 1) = 1$. Please derive the boolean function f .

Problem 9 Circuits

Problem 2.1 on BF-21

Problem 10 Circuits

Problem 2.5 on BF-21

Problem 11 Practice Problems

For practice only. You do not have to turn in the solution.

Unit BF: 1.12, 1.14, 1.15, 2.1, 2.4