Student Name: Solutions

Student ID:

Instuctor: Mustafa Altun

EHB 205E: Introduction to Logic Design

Quiz 1

Duration: 30 Minutes
Grading: 1) 20%, 2) 40%, 3) 40%,
Quiz is in closed-notes and closed-books format
For your answers please use the space provided in the exam sheet
GOOD LUCK!

1. Answer the following statements with T(true) or F(false) only.
(**do not guess**: points are deducted for wrong answers. If you do not know the answer, leave it blank)

a) F Finite decimal fraction can be always converted to finite binary fraction

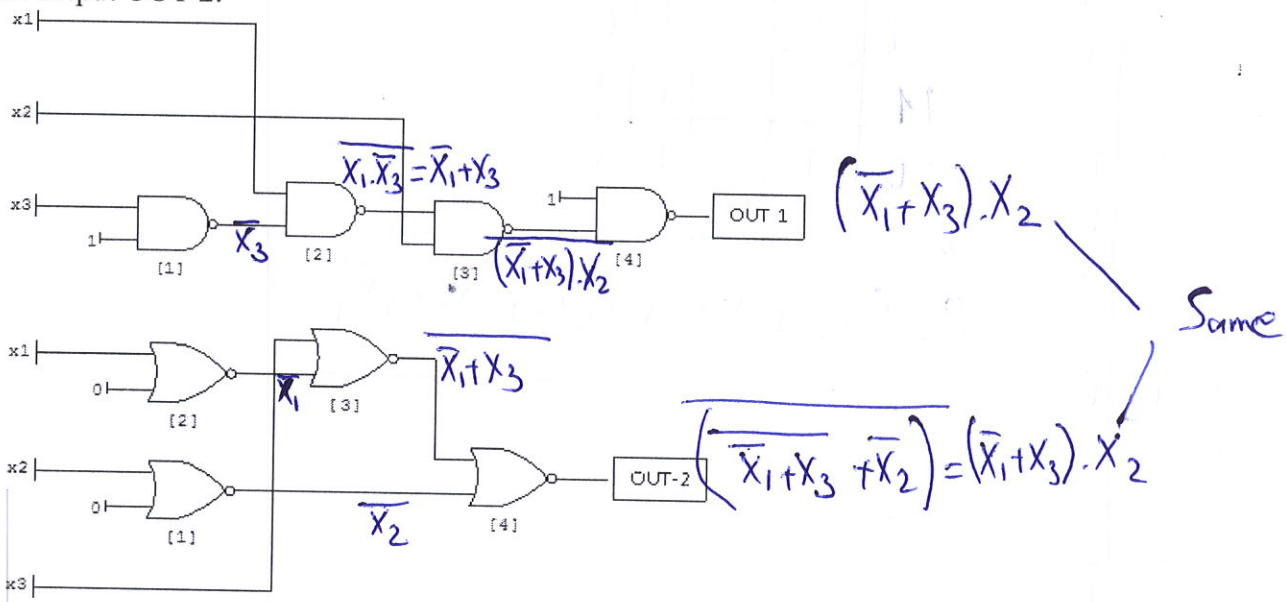
b) T Finite hexadecimal fraction can be always converted to finite binary fraction

c) T (The population of Burundi was below 1 million in 2013) NAND (banana is tastier than apple)

d) F A circuit performing a binary addition of two *n*-bit numbers needs *n* outputs.

e) T A circuit performing a binary multiplication of two *n*-bit numbers needs 2*n* outputs.

2. Consider the below two circuits having three inputs x1, x2, and x3 as well as 0 and 1 inputs. The one consisting of NAND2 gates has an output OUT 1 and the other one having NOR2 gates has an output OUT 2.



a) Derive Boolean expressions of OUT 1 and OUT 2 in terms x1, x2, and x3, and their negations.

b) Find XOR of OUT 1 and OUT 2

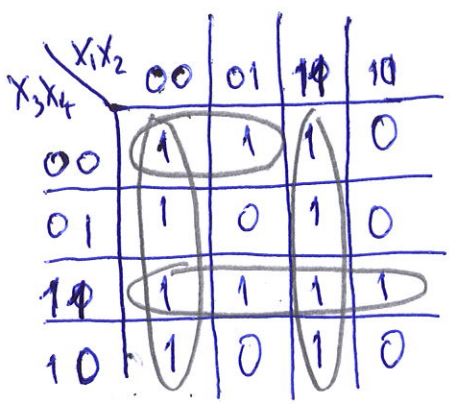
OUT 1 ⊕ OUT 2 = 0 (Because they are same)

3. Obtain a minimal sum-of-products (SOP) expression for ***f*** using a **Karnaugh** map.

$$f = \overline{x_1\,\overline{x_2}\,\overline{x_3} + x_1\,\overline{x_2}\,\overline{x_4} + \overline{x_1}x_2x_3\overline{x_4} + \overline{x_1}x_2\,\overline{x_3}\,x_4}$$

Truth Table

X_1	X_2	X_3	X_4	f
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	1
0	1	0	0	1
0	1	0	1	0
0	1	1	0	0
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	1
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1



$f = \bar{X}_1\bar{X}_2 + X_1X_2 + X_3X_4 + \bar{X}_1\bar{X}_3\bar{X}_4$