

BLG231E Digital Circuits

Quiz 1

Duration: **20** Minutes

Grading: 1) 20%, 2) 80%,

Quiz is in closed-notes and closed-books format

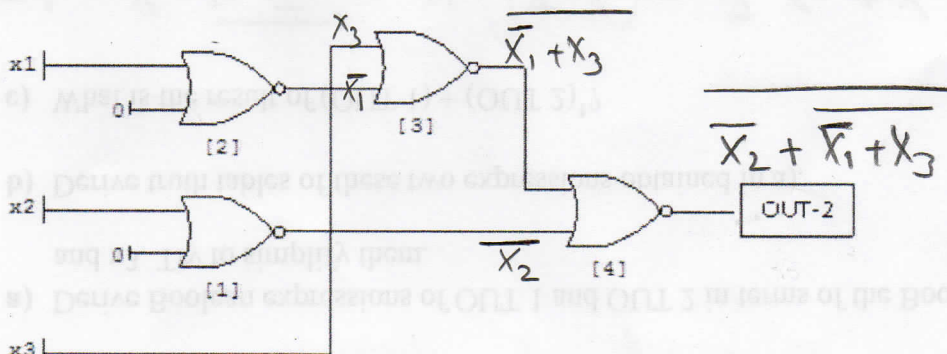
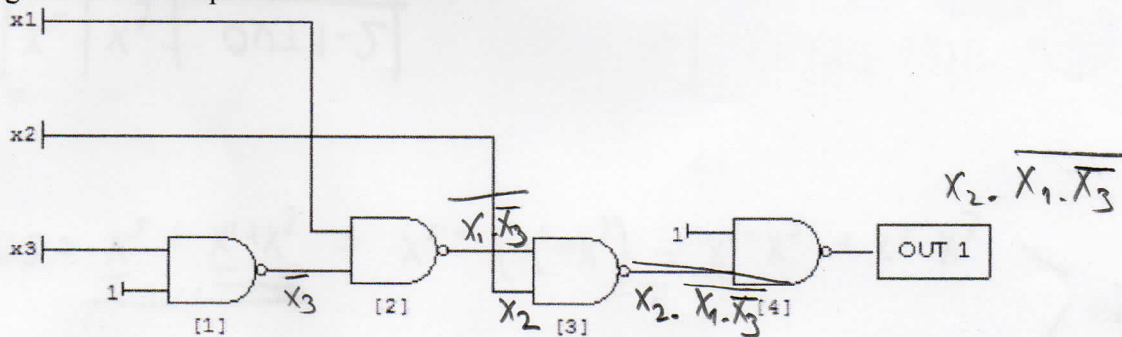
For your answers please use the space provided in the exam sheet

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
For example, 0,3 can not
- b) T Finite hexadecimal fraction can be always converted to finite binary fraction
16 = 2⁴
- c) F (The population of Burundi was 10.16 million in 2013) NOR (sweet corn is tastier than apple)
(Must be true) NOR (may be true or false) = F
Because the question have an exact answer
- d) F A circuit performing a binary addition of two n -bit numbers needs n outputs. *(n+1)*
- e) T A circuit performing a binary multiplication of two n -bit numbers needs $2n$ outputs.

2. Consider the below two circuits having three inputs x_1 , x_2 , and x_3 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 of the Boolean variables x_1 , x_2 , and x_3 . Try to simplify them.
- b) Derive truth tables of these two expressions obtained in a).
- c) What is the result of $(\text{OUT 1}) + (\text{OUT 2})'$?

$$\text{OUT 1} = X_2 \overline{X_1 \cdot X_3} = X_2 \cdot (\overline{X_1} + \overline{X_3}) = \overline{X_1} \cdot X_2 + X_2 X_3$$

$$\text{OUT 2} = \overline{X_2} + \overline{X_1 + X_3} = X_2 \cdot (\overline{X_1} + \overline{X_3}) = \overline{X_1} \cdot X_2 + X_2 X_3$$

Same

X_1	X_2	X_3	OUT1-2
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

$$\text{OUT 1} + (\text{OUT 2})' = \text{OUT 1} + (\text{OUT 1})' = 1$$

Because $f + f' \equiv 1$