Typical answer key for the STM1 S1 2023/2024 Exam

Level: 1st Year LMD C.S **Matter:** STM1 **Date :** Jan 15, 2024

Exercise 1 : (4 pts)

1. The choice of an answer:

$(10100111,1011)_2$ = a) $(B7,B)_{16}$ **b)** $(167,6875)_{10}$ c) $(257,55)_8$ **(0.5 pt)**

$(737,61)_8$ = **a)** $(1DF,C4)_{16}$ b) $(480,765)_{10}$ c) $(111111110,110001)_2$ **(0.5 pt)**

$(AD5,D8)_{16}$ = a) $(101011100101,11011)_2$ b) $(2774,85)_{10}$ **c)** $(5325,66)_8$ **(0.5 pt)**

$(167,6875)_{10}$= **a)** $(A7,B)_{16}$ b) $(267,55)_8$ c) $(10110111,1011)_2$ **(0.5 pt)**

2. The answer with 'Yes' or 'No'

Yes	**(0.5 pt)**
No	**(0.5 pt)**
Yes	**(0.5 pt)**
Yes	**(0.5 pt)**

Exercise 2 : (4 pts)

1. **A)** $(64)_{10}= (01000000)_2$ **(0.25)** , $(128)_{10}= (10000000)_2$ **(0.25)**

   B) Sign and Absolute Value:[$-(2^{n-1} - 1), +(2^{n-1} - 1)] \Leftrightarrow [-127, +127]$ **(0.25)**

   $-64 \in [-127, +127]$ => $-64 \equiv$ **1**1000000 (S.V.A) **(0.25)**

   $-128 \notin [-127, +127]$ => we cannot represent it in S.A.V. **(0.25)**

   C) 1's Complement:[$-(2^{n-1} - 1), +(2^{n-1} - 1)] \Leftrightarrow [-127, +127]$ **(0.25)**

   $-64 \in [-127, +127]$ => $-64 \equiv$ **10111111** (C.à.1) **(0.25)**

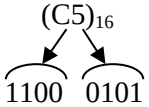
   $-128 \notin [-127, +127]$ => we cannot represent it in 1's Complement. **(0.25)**

   D) 2's Complement: $[-2^{n-1}, +(2^{n-1} - 1)] \Leftrightarrow [-128, +127]$ **(0.25)**

   $-64 \in [-128, +127]$ => $-64 \equiv$ **10111111 + 1 = 11000000** (C.à.2) **(0.25)**

   $-128 \in [-128, +127]$ => $-128 \equiv$ **01111111 + 1 = 10000000** (C.à.2) **(0.25)**

2. $(C5)_{16} = (?)_{10}$



(0.25)

=> $(C5)_{16} = (\mathbf{1}1000101)_{c.à.2}$

$(\mathbf{1}1000101)_{c.à.2}$ is negative => we will find the positive value.

11000101
- 1
11000100

00111011 (positif) **(0.25)**

$(00111011)_{c.à.2} = (00111011)_2$

$(00111011)_2 = 0\times2^7 + 0\times2^6 + 1\times2^5 + 1\times2^4 + 1\times2^3 + 0\times2^2 + 1\times2^1 + 1\times2^0$

$= 0 + 0 + 32 + 16 + 8 + 0 + 2 + 1$

$= (59)_{10}$

$\Rightarrow (00111011)_{c.à.2} = (+59)_{10}$ **(0.25)**

$\Rightarrow (C5)_{16} = (11000101)_{c.à.2}$

$= (-59)_{10}$ **(0.25)**

3. 1101001 – 1010111 = **0010010 (0.25 pt)** , 10011101÷111 = **10110.01101 (0.25 pt)**

Exercice 3 : (6 pts)

1. ASCCI code
   a) The values in base 10 corresponding to the binary numbers:
      - A: 01000001 = 65 **(0.5 pt)**; B: 01000010 = 66 **(0.5 pt)**; C: 01000011 = 67 **(0.5 pt)**
      - a:01100001 = 97 **(0.5 pt)**; b: 01100010 = 98 **(0.5 pt)**; c: 01100011 = 99 **(0.5 pt)**

   b) The ASCII codes of 'D' and 'd':
      D: 01000100 = $(68)_{10}$ **(0.5 pt)**; d: 01100100 = $(100)_{10}$ **(0.5 pt)**

2. $(642)_{10} = (0110\ 0100\ 0010)_{BCD}$ **(0.5 pt)**, $(3514)_{10} = (0011\ 0101\ 0001\ 0100)_{BCD}$ **(0.5 pt)**

3. $(0110)_2 = (0101)_{GRAY}$ **(0.5 pt)**, $(1101)_2 = (1011)_{GRAY}$ **(0.5 pt)**

Exercice 4:

1. The function *f*(*x, y,z*)

a) Canonical sum of minterms form:

$$f(x, y, z) = x + \bar{y}.z$$

$$= x(y + \bar{y})(z + \bar{z}) + (x + \bar{x})\bar{y}z$$

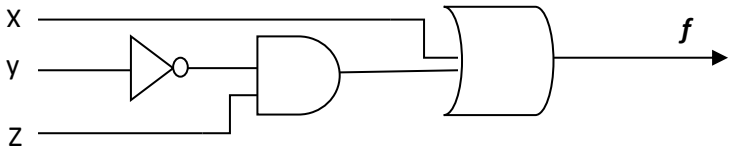
$$= xyz + xy\bar{z} + x\bar{y}z + x\bar{y}\bar{z} + \bar{x}\bar{y}z$$ **(1.25 pt)**

b) Truth table: **(1.25 pt)**

x	y	z	*f(x, y, z)*
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

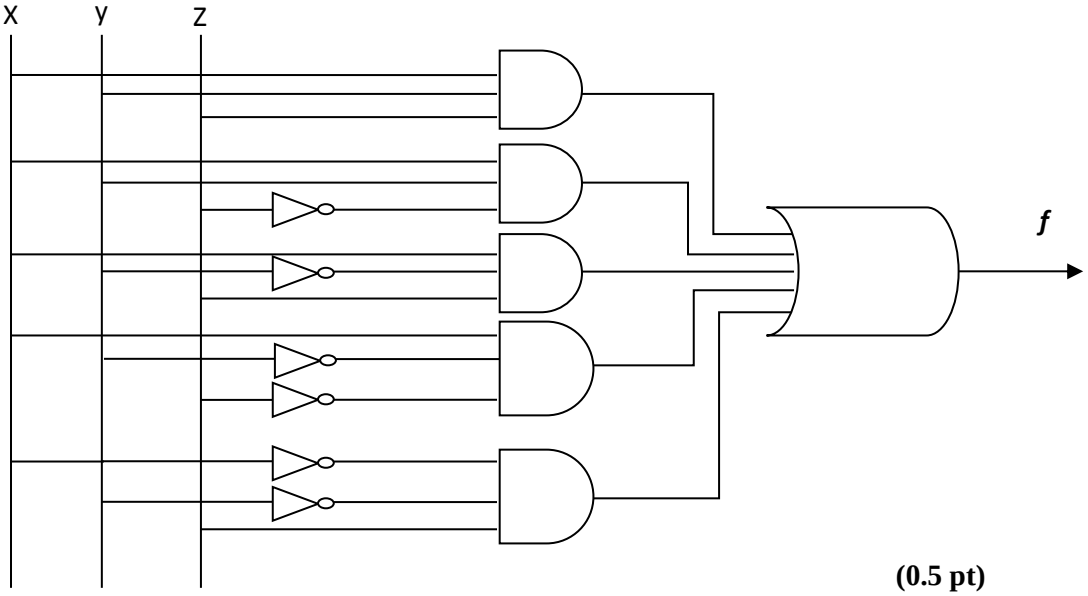
c) Logical diagram

1st expression



(0.5 pt)

2nd expression



(0.5 pt)

2. Answering course questions

a) The goals of simplifying logic functions are:

- Minimize the cost **(0.5 pt)**
- Accelerate treatment **(0.5 pt)**

b) The simplification methods are:

- The algebraic method **(0.5 pt)**
- The Karnaugh table method **(0.5 pt)**
- The Quine/McCluskey method **(0.5 pt)**