Typical answer key for the STM1 S1 2024/2025 Exam

Level: **1st Year LMD C.S** **Matter: MS1** **Date : Jan 13, 2025**

Exercise 1 : **(4 pts)**

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

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

   -64 ϵ [-127, +127] => -64 ≡ **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:[$-(2^{n-1} - 1), +(2^{n-1} - 1)]$ ⇔ [-127, +127] **(0.25)**

   -64 ϵ [-127, +127] => -64 ≡ **10111111** (C.à.1) **(0.25)**

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

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

   -64 ϵ [-128, +127] => -64 ≡ **10111111 + 1 = 11000000** (C.à.2) **(0.25)**

   -128 ϵ [-128, +127] => -128 ≡ **01111111 + 1 = 10000000** (C.à.2) **(0.25)**

2. $(D6)_{16} = (?)_{10}$

   $(D6)_{16}$

   1101 0110 **(0.25)**

   => $(D6)_{16} = (\mathbf{1}1010110)_{c.à.2}$

   $(\mathbf{1}1010110)_{c.à.2}$ is negative => we will find the positive value.

   11010110
   \- 1
   11010101

   00101010 (positif) **(0.25)**

   $(00101010)_{c.à.2} = (00101010)_2$

   $(00101010)_2 = 0\times2^7 + 0\times2^6 + 1\times2^5 + 0\times2^4 + 1\times2^3 + 0\times2^2 + 1\times2^1 + 0\times2^0$

   $= 0 + 0 + 32 + 0 + 8 + 0 + 2 + 0$

   $= (42)_{10}$

   => $(00101010)_{c.à.2} = (+42)_{10}$ **(0.25)**

   => $(D6)_{16} = (11010110)_{c.à.2}$

   $= (-42)_{10}$ **(0.25)**

3. 1101101 – 1011011 = **0010010** **(0.25 pt)** , 10011101÷111 = **10110.01101** **(0.25 pt)**

Exercise 2 : **(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)**

<u>**Exercice 3:**</u>

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

a) Canonical sum of minterms form:

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

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

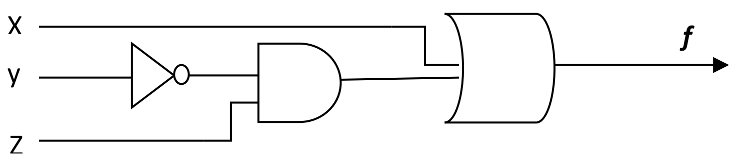
$$= xyz + xy\bar{z} + x\bar{y}z + x\bar{y}\bar{z} + \bar{x}\bar{y}z$$ **(1 pt)**

b) Truth table: **(1 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

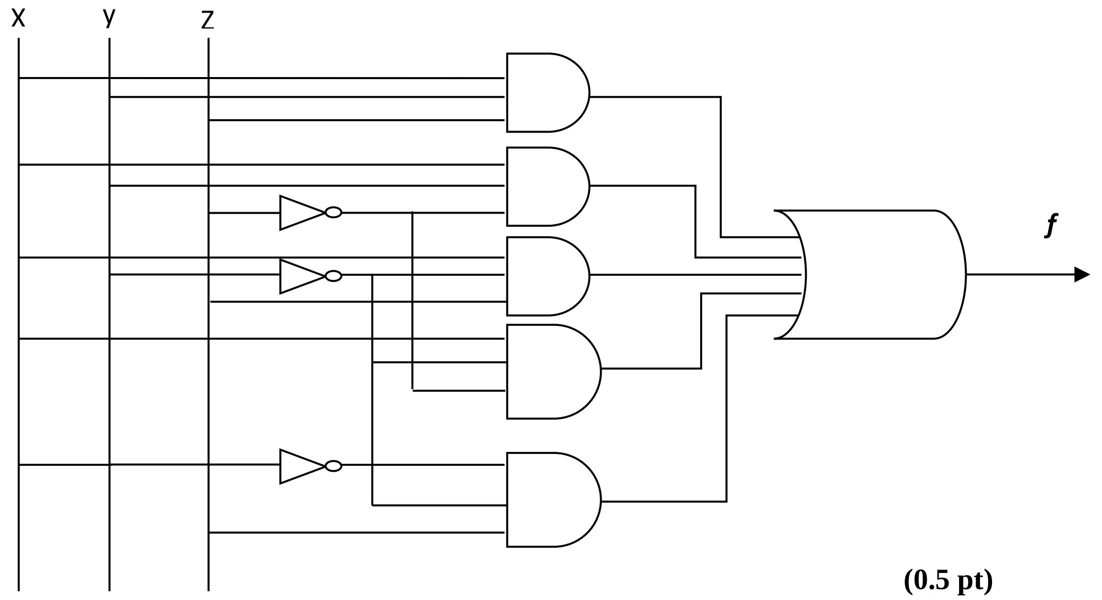
c) Logical diagram

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)**
- Reduce electrical energy consumption **(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)**

<u>Exercice 4 :</u> (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 'E' and 'e':
      E: 01000101 = $(69)_{10}$ **(0.5 pt)**; e: 01100101 = $(101)_{10}$ **(0.5 pt)**

2. $(713)_{10} = (0111\ 0001\ 0011)_{BCD}$ **(0.5 pt)**, $(4526)_{10} = (0100\ 0101\ 0010\ 0110)_{BCD}$ **(0.5 pt)**

3. $(0101)_2 = (0111)_{GRAY}$ **(0.5 pt)**, $(1011)_2 = (1110)_{GRAY}$ **(0.5 pt)**