Typical answer key for the 2nd semester Exam (Debts)

Level: **1st Year LMD CS** **Module:** **MST1** **Date:** **01/13/2025**

Exercise 1 : (6 pts)

1. 1101001 – 1010111 = 0010010 **(0.25 pt)** 1111÷111 = 10.001 **(0.25 pt)**
2. $(10110.10110)_2 = (26.54)_8$ **(0.25 pt)**, $(101100111)_2 = (547)_8$ **(0.25 pt)**
   $(10110.10110)_2 = (16.B0)_{16}$ **(0.25 pt)**, $(101100111)_2 = (167)_{16}$ **(0.25 pt)**
3. **A)** $(32)_{10} = (00100000)_2$, $(64)_{10} = (01000000)_2$, $(128)_{10} = (10000000)_2$ **(0.25), (0.25), (0.25).**

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

   -32 ϵ [-127, +127] => -32 ≡ **1**0100000 (S.V.A) **(0.25)**

   -64 ϵ [-127, +127] => -64 ≡ **1**1000000 (S.V.A) **(0.25)**

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

   B) Complement to 1 :[$-(2^{n-1} – 1), +(2^{n-1} – 1)]$ ⇔ [-127, +127] **(0.25)**

   -32 ϵ [-127, +127] => -32 ≡ **11011111** (C.à.1) **(0.25)**

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

   -128 ∉ [-127, +127] => we cannot represent it in C.à.1. **(0.25)**

   B) Complement to 2 :[$-2^{n-1}, +(2^{n-1} – 1)]$ ⇔ [-128, +127] **(0.25)**

   -32 ϵ [-128, +127] => -32 ≡ **11011111 + 1 = 11100000** (C.à.2) **(0.25)**

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

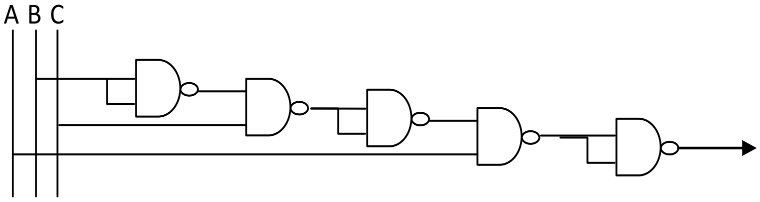
   -128 ∉ [-128, +127] => -128 ≡ **01111111 + 1 = 10000000** (C.à.2) **(0.25)**

4. Using **NAND** only :

$$A.\overline{\left(B+\overline{C}\right)} = \overline{\overline{A.\overline{\left(B+\overline{C}\right)}}} = \overline{\overline{A.\overline{\left(B+\overline{C}\right)}} \cdot \overline{A.\overline{\left(B+\overline{C}\right)}}} \quad \Lambda\ (1)$$

$$\overline{\left(B+\overline{C}\right)} = \overline{B}\cdot C = \overline{\overline{\overline{B}\cdot C}} = \overline{\overline{\overline{B}\cdot C}\cdot\overline{\overline{B}\cdot C}} = \overline{\overline{\overline{B.B}\cdot C}\cdot\overline{\overline{B.B}\cdot C}}$$

$$\Rightarrow \quad (1) = \overline{\overline{A.\overline{\overline{\overline{B.B}\cdot C}\cdot\overline{\overline{B.B}\cdot C}}} . \overline{A.\overline{\overline{\overline{B.B}\cdot C}\cdot\overline{\overline{B.B}\cdot C}}}}$$ **(0.5 pt)**



(0.25 pt)

Exercise 2: (6 pts)

1) Sum of mintermes :

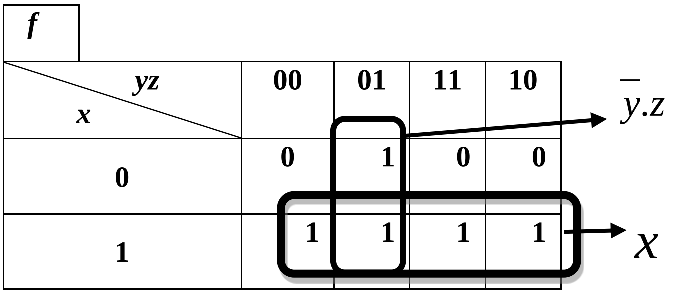
$$f(x, y, z) = x + \overline{y}.z = x(y+\bar{y})(z+\bar{z}) + (x+\bar{x})\bar{y}z$$

$$= xyz + xy\bar{z} + x\bar{y}z + x\bar{y}\bar{z} + \bar{x}\bar{y}z$$ **(1.5 pt)**

2) Truth table : (1.5 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

3) Simplification using karnaugh table (1 pt)

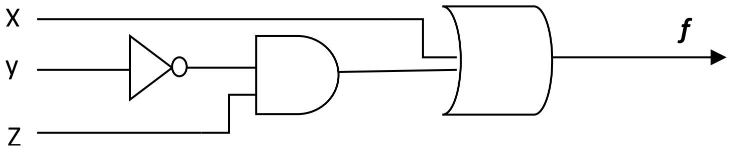


f *x* \ *yz*	**00**	**01**	**11**	**10**
0	**0**	**1**	**0**	**0**
1	**1**	**1**	**1**	**1**

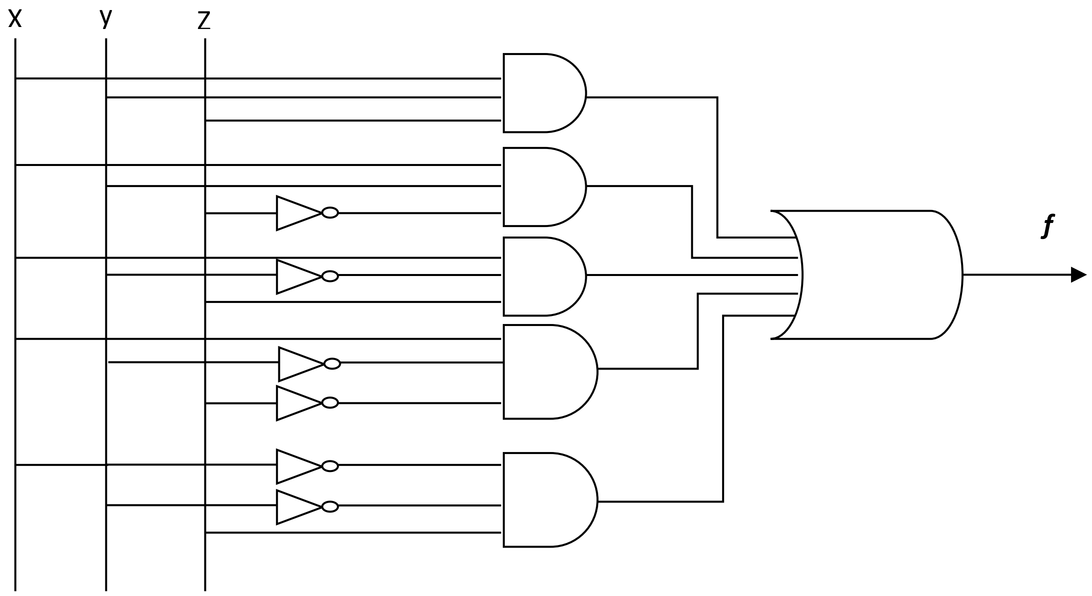
$$\Rightarrow \quad f(x, y, z) = x + \overline{y}.z$$

3) Logigram :

a) $f(x, y, z) = x + \overline{y}.z$ **(0.5 pt)**



b) $f(x,y,z) = xyz + xy\bar{z} + x\bar{y}z + x\bar{y}\bar{z} + \bar{x}\bar{y}z$ **(0.5 pt)**



- **Conclusion :** we can conclude that the circuit in diagram **a)** is faster and less expensive than that in diagram **b)**. So simplification is essential. **(1 pt)**

Exercise 3 : (4pts)

1. - Minimize the cost **(0.75 pt)** - Accelerate the treatment **(0.75 pt)**
2. - The algebraic method **(1 pt)**
   - The Karnaugh table method **(1 pt)**
   - The Quine/McCluskey method **(0.5 pt)**

Exercise 4 : (4 pts)

Exercice 4 : (4 pts)

Yes	**1 pt**
Yes	**1 pt**
Yes	**1 pt**
No	**1 pt**