University of M'Sila
Maths & CS Faculty
Computer Science Department

Exam (S1)
Machine Structure 1

Date : 01/14/2024
Duration : 01h :30

(A) ممنوع استخدام الآلة الحاسبة والهاتف النقال

First and Last Name : ……..…..… **Group:** ……

Exercise 1: (4.5 Pts = 3.5(2.25 (0.75 ×3) + 0.75 + 0.5) +1)

1) Make the following conversions **:**

10	2	8	16
$16^2 + 8^2 + 2^4 + 2^2 + 16^{-1} + 8^{-1}$			
		76,5	
			AE,6

$39_{(16)}$ = ……...…..…… (BCD) = ……..…..…… (Excess3) = …… (10)

$1101011_{(Gray)}$ = …… (10) = ……..…… (2)

2) Perform the following operation in **Excess-3** : $65_{(8)} + 54_{(16)}$

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Exercise 2: (4.5 Pts = 2.25 (0.75 ×3) + 2.25 (1.5+0.75))

1) Give **the decimal values** corresponding to the octal content on **8 bits**, knowing that this content is represented in **S-Mag, 1'sC, 2'sC**: $354_{(8)}$

S-Mag : ……=…….=……..…..

1'sC : ...…..……=…….=……..

2'sC : ..……...=…….=.…….

2) Perform the following operations on **9 bits** in **1'sC** and give the results in decimal:

$-56_{(16)} + 74_{(8)}$

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$+56_{(8)} + FD_{(16)}$

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Exercise 3: (4 pts = 2 (1+1) + 2 (1+1))

Taking the notation of the **simple precision floating point (32 bits)** of the IEEE 754 standard

1) Give the representation in **SP floating point** (32 bits) of the following numbers:

$$\mathbf{-43.625\times 2^{-107}}_{(10)} \quad /// \quad \mathbf{+53.75\times 2^{-134}}_{(10)}$$

2) Put in the form $\pm a \times 2^{b}$ the two following hexadecimal contents:

$$\mathbf{X = 24E00000_{(16)}}, \mathbf{Y = 80500000_{(16)}} \ (a \text{ and } 2^{b} \text{ are } \mathbf{decimals})$$

Exercise 4: (7 pts = 1.5+1.5+0.75+0.75+2.5 (1+1.5))

$$F1(X,Y,Z) = (X+Y)Z + \overline{X}(\overline{Y}+Z) + \overline{Y}$$

$$F2(A,B,C) = (A+\overline{B}+\overline{C})(A+\overline{B}+C)(A+B+\overline{C})$$

$$F3\ (A,B,C,D) = \sum(0,1,3,5,6,10,15) + \Phi(2,4,7,11)$$

1. Simplify $F1$ using Algebraic simplification and write the truth table of $F1$.
2. Write the two canonical forms of $F1$.
3. Draw the logigram of $F1$ (simplified) only with NAND gates.
4. Simplify $F2$ using Algebraic simplification.
5. Simplify $F2$ and $F3$ using Karnaugh maps in the form of Sum of Products (**SoP**) and Product of Sums (**PoS**).