

Duration: 2 hours

Study Level: Academic L1 in Computer Science.

Exam of Machine Structure 1

Exercise 1 (4.5 pts)

1. Convert the following numbers:

a. $(5.3B9)_H = (?)_8 = (?)_{IEEE-754(DP)}$

b. $(55.44)_{10} = (?)_5$

2. Find the coefficient x such that: $(11xx1)_3 = (x50)_7$

NB: Provide the details of your calculations

Exercise 2 (5 pts) (Micro-interrogation 2)

Perform arithmetic operations in the corresponding bases as follows:

1. $(9A9C.B9 + 759.7)_{14} = (?)_{14}$

2. $(41.5)_{11} \times (2.37)_{11} = (?)_{11}$

3. $(100000 - 11111)_2$ (Par Cà1 et Cà2)

4. $(876/34)_9 = (?)_9$

5. $(701.3 - 89.B)_{12} = (?)_{12}$

NB: Provide the details of your calculations

Exercise 3 (4.5 pts)

1. Let the numbers A and B be expressed in BCD code such that

$A = 0001\ 1001\ 0111$ et $B = 0001\ 0011$

a. Perform the operation $A+B$.

b. Convert A to **Decimal** and **Excess-3** code.

c. Prepare the appropriate Gray code table and provide the Gray code for the number B

2. Consider Table 1, which provides the equivalents of the decimal values 3, 4, 6, 7 in the (abcd) code. Find the weights of the (a b c d) code.

Dec	Code			
	a	b	c	d
3	0	0	1	1
4	0	1	0	0
6	1	0	0	1
7	1	0	1	0

Table 1

Exercise 4 (6 pts)

Let F be a Boolean function with four variables a, b, c, d defined as follows: $F_{(a,b,c,d)} = (a + \bar{b})(\bar{c} + d)(b + d)$

1. Construct the truth table for F .

2. Provide the numerical form of the expression for F .

3. Simplify the function F using algebraic method.

4. Simplify the function F using the Karnaugh table.

5. Compare the obtained results. State which of the two simplification methods is better?

6. Draw the logic diagram of the simplified F using AND and OR gates with only two inputs each and inverter (NOT) gates.

NB: Assign the MSB to the variable 'a'.

Success wishes!