National School of Autonomous Systems Technologies

Second Year Engineering **Subject: Combinatorial and sequential logic** **Academic year: 2024-2025**

Information Coding and Numeration Systems

Exercise 1

- Convert binary numbers 11, 1101, 100101110 to decimals.
- Convert decimal numbers to binary numbers: 7, 51, 128, 131, 234.
- Convert the following hexadecimal numbers to binary and decimal numbers: 12, DADA and 5F3.

Exercise 2

Represent the numbers $(28)_{10}$, $(129)_{10}$, $(147)_{10}$, $(255)_{10}$ in their binary form by a method other than successive divisions.

Exercise 3

Represent the number $(248)_{10}$ in bases 2, 3, 8, 9 and 16.
(Use the technique of successive divisions for bases 2, 3 and 16.)

Exercise 4

We work in this exercise on natural integers encoded on a byte

4.1. What are the natural integers that can be represented on a byte?

4.2. Give the result of the following operations in binary and then decimal.

(a) $(0001\ 0101)_2 + (1011\ 0111)_2$

(b) $(0100\ 0111)_2 + (1101\ 1001)_2$

Exercise 5

5.1. If we want to multiply any binary number by 2 or a power of 2, what other operation can be done to avoid multiplication?

5.2. Multiply the binary numer `10001001` by 3 and 10 using the traditional technique of multiplication.

Exercise 6 — Binary Offset

Code in binary the numbers 26 and 52. What is noticed? Deduce a quick method to multiply or divide by 2^k a binary number. Generalize to any B base.

Exercise 7

Give the decimal, minimum and maximum values that can be taken by signed and unsigned numbers coded on 4, 8, 16, 32 and n bits.

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