Sétif 1 University
Faculty of Sciences
Common Core Mathematics and Computer Science

1st semester (year 2025/26)
Machine Structures 1 course
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Machine Structures 1 exam (BD)

(duration 1h30)

Exercise 1 :(4 points)

1. Give two examples of output devices ?
2. How many bits are needed to represent a single hexadecimal digit ?
3. What is a bit ?
4. What is a "Minterm" ?

Exercise 2 :(5 points)

1. Convert $(1024)_{10}$ to binary.
2. Convert $(1100111010)_2$ to hexadecimal.
3. Convert $(A.C)_{16}$ to decimal. (Be careful $(A.C)_{16}$ is a fractional number)
4. Determine the unknown base x such that: $(22)_x = (16)_{10}$
5. Perform the following binary multiplication: $(101)_2 \times (110)_2$

Exercise 3 :(5 points)

1. Given the binary string $[1111]_{4\text{-bits}}$, decode it into decimal as: Unsigned Integer (UI), Sign-Magnitude (SM), One's Complement (1C), Two's Complement (2C).
2. Perform the following subtraction in 8-bit Two's Complement: $(-64)_{10}-(+65)_{10}$. Show all steps and analyze the validity of the result (check for overflow).
3. Encode the decimal number $(+25.75)_{10}$ into the 32-bit IEEE 754 format.

Exercise 4 :(6 points)

1. Reduce the following Boolean expression using theorems and axioms: $F(A,B) = A + \overline{A}B$.
2. Trace the Truth Table for the following 3-variable Boolean function: $F(A,B,C)=AB+\overline{C}$
3. Derive the Product of Sums (PoS) expression related to the previous Truth Table.
4. Use the Quine-McCluskey method to find the minimal expression for Truth Table of question 2.

دعوة بالتوفيق