**Homework – teams of 2 students**

* **Deadline - 5th week of the semester**
* **The students from the same team will work separately and when they have the final results they will put all together in the same document.**
* **Write in the document all the intermediate calculations and necessary explanations.**

**Subject 1: operations**

* Students will work with two bases: **b1** and **b2**, one of them is less than 10 and the other one is 16.
* **Student 1** chooses **b1, b2, x, y, z**, **f** and performs the operations:

**x(b1) + y(b1) = s(b1),** x has 6 digits and y has 5 digits

**z(b2)\* f(b2) = p(b2),** z has 6 digits, f is a digit

* **Student 2** receives **s, y, p, f,** from Student 1 and performs the following operations to verify the correctness of the results obtained by Student 1:

**s(b1) - y(b1)= ? (b1**)

**p(b2) : f(b2)= ? (b2)**

**Subject 2: conversions of real numbers choosing the appropriate methods**

* **Student 2:**
  + chooses **b** (source base) and **h** (destination base) such that **b ≠ 10, h ≠ 10** and **b < h.**
  + choosesthe initial real number **x(b)** having 5 digits at the integer part and 3 digits at the fractional part
  + converts **x(b**) into base **h,** with a precision of 3 digits, obtaining **y(h)**
* **Student 1** receives **y(h)** from Student 2 and converts **y(h)** into base **b,** with a precision of 3

digits to verify the correctness of the result obtained by Student 2

* Don’t use rapid conversions!
* Don’t use base 10 as an intermediate base!

**Subject 3: representations**

**Option 1: addition and subtraction of integers in complementary code**

* **Student 1**
  + chooses three integer positive decimal numbers (at least 5 digits each): x, y, z , such that x < y < z.
  + represents in direct, inverse and complementary codes on 16 bits, x, -x, y,-y, z, -z.
* **Student 2**
  + receives from Student1: [x] compl, [-x] compl, [y] compl, [-y] compl, [z] compl, [-z] compl.
  + performs in complementary code the following operations:

[x + y]compl, [x – y] compl, [z – x] compl , [-z - x] compl

* + from the complementary codes obtained in the previous step calculates the corresponding decimal values.

**Option 2: addition and subtraction of subunitary numbers in complementary code**

* **Student 1**
  + chooses three subunitary positive decimal numbers (at least 3 digits at the fractional part): x, y, z , such that x < y < z.
  + represents in direct, inverse and complementary codes on 16 bits, x, -x, y,-y, z, -z.
* **Student 2**
  + receives from Student1: [x] compl, [-x] compl, [y] compl, [-y] compl, [z] compl, [-z] compl.
  + performs in complementary code the following operations:

[x + y]compl, [x – y] compl, [z – x] compl , [-z - x] compl

* + from the complementary codes obtained in the previous step calculates the corresponding decimal values.

**Option 3: fixed-point representation of real numbers**

* **Student 1**:
  + chooses a real number **x** in decimal, with 5 digits at the integer part and 2 digits at the fractional part.
  + represents **x** in fixed-point notation, on 32 bits, with I=15, F=16
  + writes the content of the memory location in hexadecimal: M(16)
* **Student 2:**
  + receives M(16) from Student 1and finds the real decimal number having M(16) as its fixed-point representation, with I=15, F=16, to verify the correctness of the result obtained by Student 1

**Option 4: floating-point representation of real numbers, with mantissa>1**

* **Student 1**:
  + chooses a real number **x** in decimal, with 5 digits at the integer part and 2 digits at the fractional part.
  + represents **x** in floating-point notation, SP, mantissa >1
  + writes the content of the memory location in hexadecimal: M(16)
* **Student 2:**
  + receives M(16) from Student 1and finds the real decimal number having M(16) as its floating-point representation, SP, mantissa >1, to verify the correctness of the result obtained by Student 1

**Option 5: floating-point representation of real numbers, with mantissa<1**

* **Student 1**:
  + chooses a real number **x** in decimal, with 5 digits at the integer part and 2 digits at the fractional part.
  + represents **x** in floating-point notation, SP, mantissa <1
  + writes the content of the memory location in hexadecimal: M(16)
* **Student 2:**
  + receives M(16) from Student 1and finds the real decimal number having M(16) as its floating-point representation, SP, mantissa <1, to verify the correctness of the result obtained by Student 1