Quick evaluation of technical skills and research aptitude

In this test, we ask you to demonstrate that you have good **communication** and **technical** skills along with a strong **research aptitude** to start a graduate program (MSc or PhD) in our laboratory. There are two problems to solve. The first one requires skills in C/C++ programming and the second one requires skills in circuit design (VHDL). We highly recommend that you go through the following steps:

a) Read the problem statements
b) Look for some already existing methods on the Internet to address such problems
c) Report the different methods you found
d) Propose your own solution to the problems and justify your design choices
e) Present the results you obtain
f) Present a discussion where you compare your work to already existing works
g) Give a short conclusion

Problem 1

Write a C/C++ code that computes the minimum Hamming distance between the 32-bit words in an array:

```
int min_Hamming(unsigned in tab[], unsigned int tab_size) {

      … // your code

}
```

Think at optimizing the processing time and memory size required to compute the result as much as you can.

Problem 2

Write the VHDL code of a circuit (FPGA) that computes the greatest common divisor (GCD) between two 32-bit integers. If possible, please report the simulation results when your circuit computes the GCD of 14 et 161.

Think at optimizing the processing time and the circuit size as much as you can.