Computer Architecture Lab (CS 341)

Assignment 5: Function Implementation on MIPS Due Date: 30/09/20

(Lab Assignment 3)

1. Write a MIPS program to do the following:
   The program should input an **integer** of at most 4 decimal digits – this is the modulus, *n*.
   The program should input a **string** of 12 **decimal** digits (most significant digit first). This represents a 12-digit integer(padded with 0s, if needed). Call it *a*.

   The program should compute *a* mod *n* and display this value on the screen (result should be between 0 and n-1, i.e., $0 \leq a \bmod n \leq n-1$).

   Your program should prompt the user for input as shown below.

   Your program should include a couple of subroutines. (Ideally, at least one of them should be a non-leaf routine.)
   Constraints: n>=1, integer represented by a>=0.

   Sample run:
   Enter modulus: 1000
   Enter string of 12 decimal digits: 123456789012
   123456789012 mod 1000 = 12
   Wish to continue?: Y

   Enter modulus: 25
   Enter string of 12 decimal digits: 246801357988
   246801357988 mod 25 = 13
   Wish to continue?: N

   Output by your program is in **blue color**.

   You may wish to use the following easily provable theorems from Modulo Arithmetic:

   $$(a + b)\ mod\ n\ =\ (\ (a\ mod\ n)\ +\ (b\ mod\ n)\ )\ mod\ n \quad \text{and}$$
   $$(a * b)\ mod\ n\ =\ (\ (a\ mod\ n)\ *\ (b\ mod\ n)\ )\ mod\ n$$

2. Implement a recursive function to compute the gcd of two integers. (The gcd is the greatest common divisor or common factor shared by two integers. For example, gcd(210, 112) = 14.)
   For two integers m and n, $m >= n$, gcd (m , n) = n if m % n = 0.
   Otherwise, gcd(m , n) = gcd(n , m % n).
   So, gcd(210,112) = gcd(112,98) = gcd(98,14) = 14.

   Your function should prompt the user for the two integer inputs m and n and then print the value of gcd (m , n).

Constraints: m,n >= 1.

Sample run:

Enter m: 210
Enter n: 112
gcd(210,112) = 14
Wish to continue?: Y

Enter m: 462
Enter n: 363
gcd(462,363) = 33
Wish to continue?: N

Output by your program is in **blue color**.