<u>Program1:</u> ALP to find LCM and GCD of two numbers

<u>Logic:</u>

     We first find the greater of the two numbers and then employ long division method to find HCF (or GCD). The we use the formula :

LCM *GCD = number1 * number2

<u>Compilation:</u>

```
nightfury@LAPTOP-DQCTLH0J:/mnt/d/DHEERAJ/BTECH/4th SEM/Computer Organisation - Lab/END SEM$ nasm -f elf Program1.asm;ld -m elf_i386 -s -o rsh Program1.o; ./
rsh
```

<u>Execution and Output:</u>

```
nightfury@LAPTOP-DQCTLH0J:/mnt/d/DHEERAJ/BTECH/4th SEM/Computer Organisation - Lab/END SEM$ nasm -f elf Program1.asm;ld -m elf_i386 -s -o rsh Program1.o; ./
rsh

First number is: 15

Second number is: 25

GCD is: 5

LCM is: 75
```

```
nightfury@LAPTOP-DQCTLH0J:/mnt/d/DHEERAJ/
rsh

First number is: 15

Second number is: 25

GCD is: 5

LCM is: 75

nightfury@LAPTOP-DQCTLH0J:/mnt/d/DHEERAJ/
rsh

First number is: 3

Second number is: 25

GCD is: 1

LCM is: 75
```

<u>Program1:</u> ALP to find LCM and GCD of two numbers

Program 2: Implement the Verilog modelling for the Division Unit without directly using divide and modulo operations. The Division can be either Restoring Division or Non-Restoring Division. The Division Unit shall take two inputs A and B (each one of 10 bits), and shall produce result (A/B) of 10 bits and remainder of 10 bits. (For Eg: A = 23 and B = 6, then result (A/B) = 3 and remainder = 5.). Write a test set for the same.

Logic:

1. Store Dividend in Q and Divisor in M and initialise AC to 0s
2. Left Shift AC and Q such that Q's MSB becomes AC's LSB and Q's LSB is empty for now.
3. Subtract M from AC (i.e. Add 2's complement of M to AC)
    a. If result is negative i.e. MSB is 1:
        i. We need to restore M i.e. we add M to AC
        ii. Then we push 0 onto Q's empty block
    b. Else if the result is positive it means subtraction is possible and so we push 1 to Q's empty block
4. We repeat the above process for n times where n = number of bits in dividend
5. Finally, **AC will have the remainder while Q will have quotient**

Compilation:

```
nightfury@LAPTOP-DQCTLH0J:/mnt/d/DHEERAJ/BTECH/4th SEM/Computer Organisation - Lab/END SEM$ iverilog Restoring_div.v
nightfury@LAPTOP-DQCTLH0J:/mnt/d/DHEERAJ/BTECH/4th SEM/Computer Organisation - Lab/END SEM$ ./a.out
```

Execution and Output:

```
nightfury@LAPTOP-DQCTLH0J:/mnt/d/DHEERAJ/BTECH/4th SEM/Computer Organisation - Lab/END SEM$ iverilog Restoring_div.v
nightfury@LAPTOP-DQCTLH0J:/mnt/d/DHEERAJ/BTECH/4th SEM/Computer Organisation - Lab/END SEM$ ./a.out
                    0    Num_1 =    7    Num_2 =    2    Qoutient =    3       Remainder =    1
                   10    Num_1 =   87    Num_2 =    6    Qoutient =   14       Remainder =    3
                   20    Num_1 =   94    Num_2 =    2    Qoutient =   47       Remainder =    0
nightfury@LAPTOP-DQCTLH0J:/mnt/d/DHEERAJ/BTECH/4th SEM/Computer Organisation - Lab/END SEM$
```

```
nightfury@LAPTOP-DQCTLH0J:/mnt/d/DHEERAJ/BTECH/4th SEM/Computer Organisation - Lab/END SEM$ ./a.out
                0    Num_1 =   94    Num_2 =    2    Qoutient =   47       Remainder =    0
               10    Num_1 =  350    Num_2 =  162    Qoutient =    2       Remainder =   26
               20    Num_1 =   94    Num_2 =   34    Qoutient =    2       Remainder =   26
               30    Num_1 =   94    Num_2 =  322    Qoutient =    0       Remainder =   94
               40    Num_1 =  198    Num_2 =    6    Qoutient =   33       Remainder =    0
nightfury@LAPTOP-DQCTLH0J:/mnt/d/DHEERAJ/BTECH/4th SEM/Computer Organisation - Lab/END SEM$
```

```
  0    Num_1 = 0001011110    Num_2 = 0000000010    Qoutient = 0000101111    Remainder = 0000000000
 10    Num_1 = 0101011110    Num_2 = 0010100010    Qoutient = 0000000010    Remainder = 0000011010
 20    Num_1 = 0001011110    Num_2 = 0000100010    Qoutient = 0000000010    Remainder = 0000011010
 30    Num_1 = 0001011110    Num_2 = 0101000010    Qoutient = 0000000000    Remainder = 0001011110
 40    Num_1 = 0011000110    Num_2 = 0000000110    Qoutient = 0000100001    Remainder = 0000000000
-DQCTLH0J:/mnt/d/DHEERAJ/BTECH/4th SEM/Computer Organisation - Lab/END SEM$
```