VLSI Engineering Lab Assignment 3

Instruction: You are required to submit a neatly labeled circuit diagram of the combined unsigned and two's complement array multiplier and answer the associated questionnaire in hard copy (one per group), and demonstrate the working of the Verilog codes and simulation outputs in your respective laptops or computer. Kindly zip your Verilog codes and test bench codes in a folder named by GROUP*<NO>* and email it to *<sudarshansharma04@gmail.com>, <harshit.roy30014@gmail.com> and <nitinkush16@gmail.com>* before coming to class on 28st January 2020.

Write the Verilog code to find the greatest common divisor of two 8 bit unsigned numbers using Stein's algorithm.

To find the GCD of two numbers a and b (as has been discussed in the lab)

1) Create two registers that will store a and b respectively.
2) Implement the odd/even halting logic that would signal and freeze the output when the GCD calculation is complete (try to reuse previously designed elements)
3) Implement a control logic to obtain the value of a and b in the next iteration using the minimum number of 2:1 multiplexers.
4) Design the circuit elements or logic that would act as the inputs to the 2:1 multiplexers - (elements to compute a/2, b/2, |a-b| and min(a,b)). Try to optimize your architecture such that you do not need to construct independent blocks computing |a-b| and min(a,b).
5) Implement a counter that would increment in the iteration when both the numbers are even.
6) Report the final result, the value stored in the register and the counter. The output should be the GCD of the two numbers a and b.
7) Implement a halting logic that would signal and freeze the output when the GCD calculation is complete (try to reuse previously designed elements)

Answer the following questions

1) Draw an FSM based formulation of the Stein's GCD Algorithm (hint- there are 4 states, and the system is in one of the four states at every iteration).
2) What can be an efficient way of using Stein's GCD Algorithm for finding the GCD of three numbers?