



**DIGITAL SYSTEM
DESIGN
APPLICATION
FINAL PROJECT**

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INTRODUCTION

SUBJECT: Calculate $C = A/B$ where A is a 8-bit positive integer and B is a 4-bit positive integer. There will be two 8-bit positive integer outputs as quotient, Q , and remainder, R .

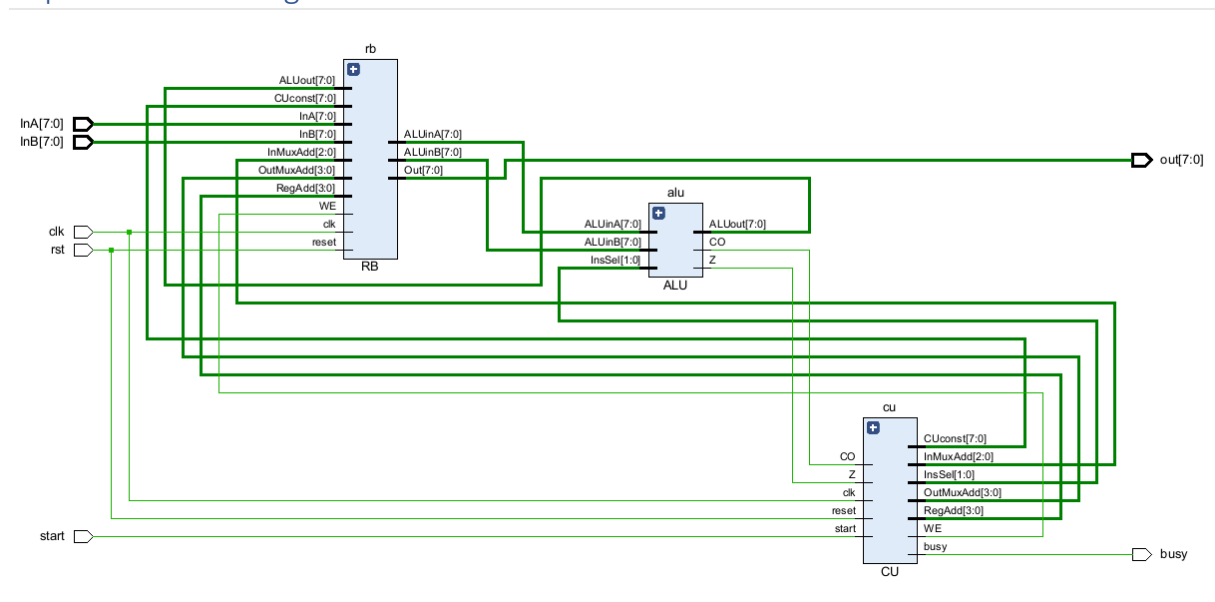
PROBLEM SOLUTION/ PREPARATION

ALGORTITHMIC STATE MACHINE

TOP MODULE

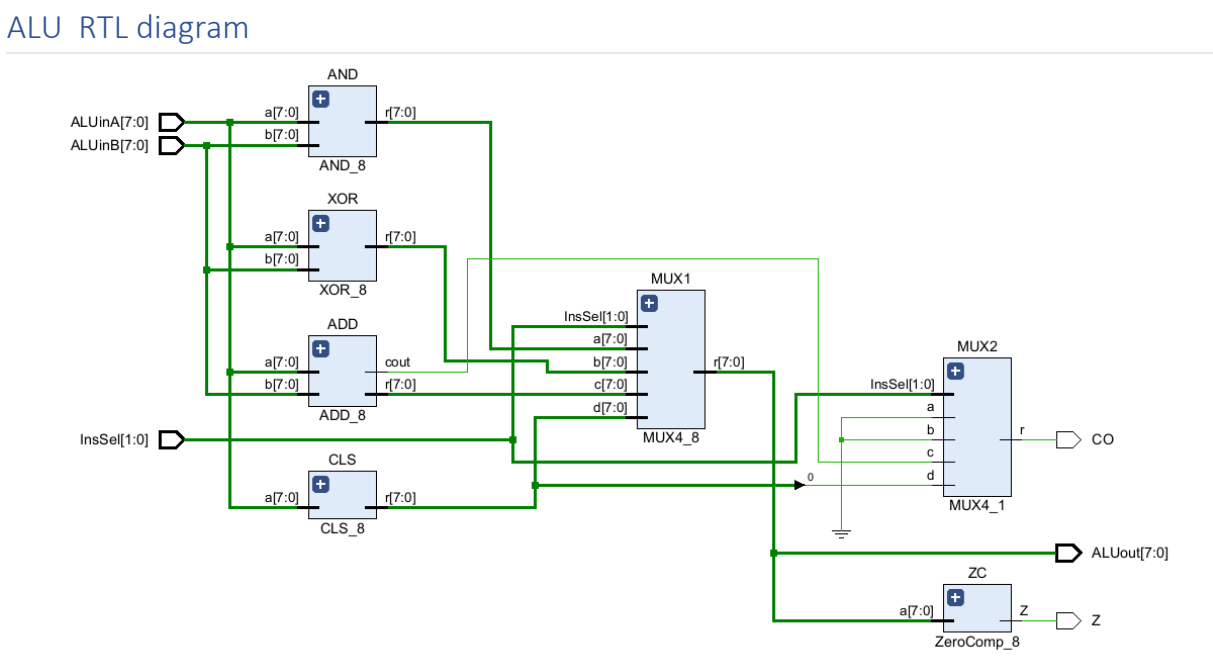
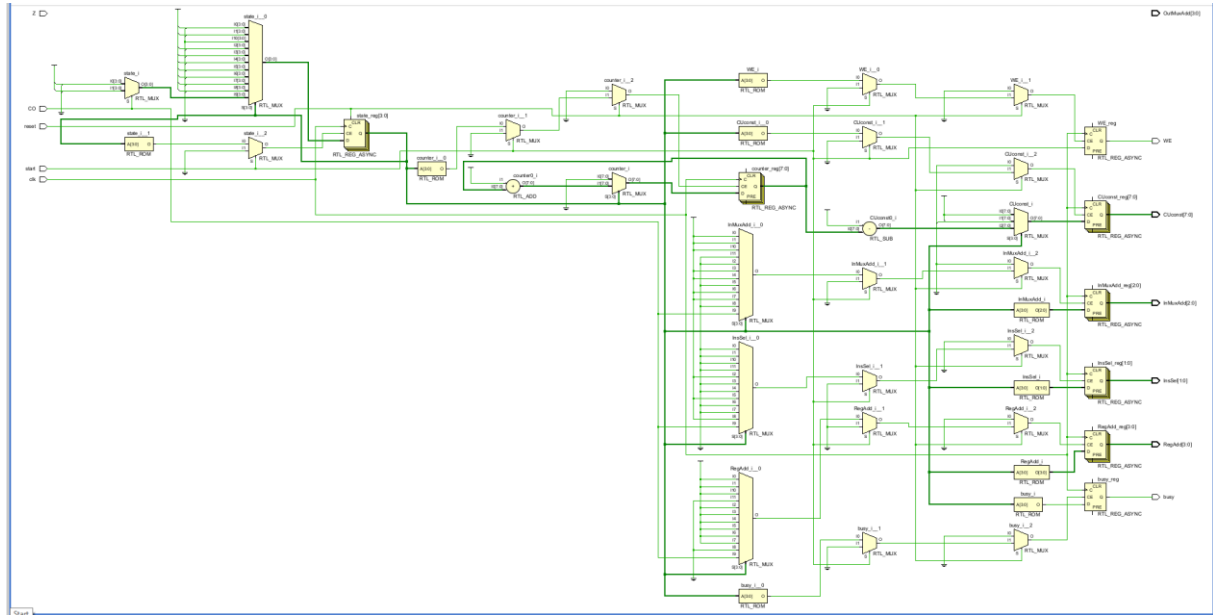
Verilog code was written in accordance with the schema of the given TOP file and the previously written reegister block, control unit, arithmetic and logic unit blocks were added and the RTL diagram of the figure is shown in the figure. Written based on TOP module in testbench and its results are shown

Top module RTL diagram



CONTROL UNIT

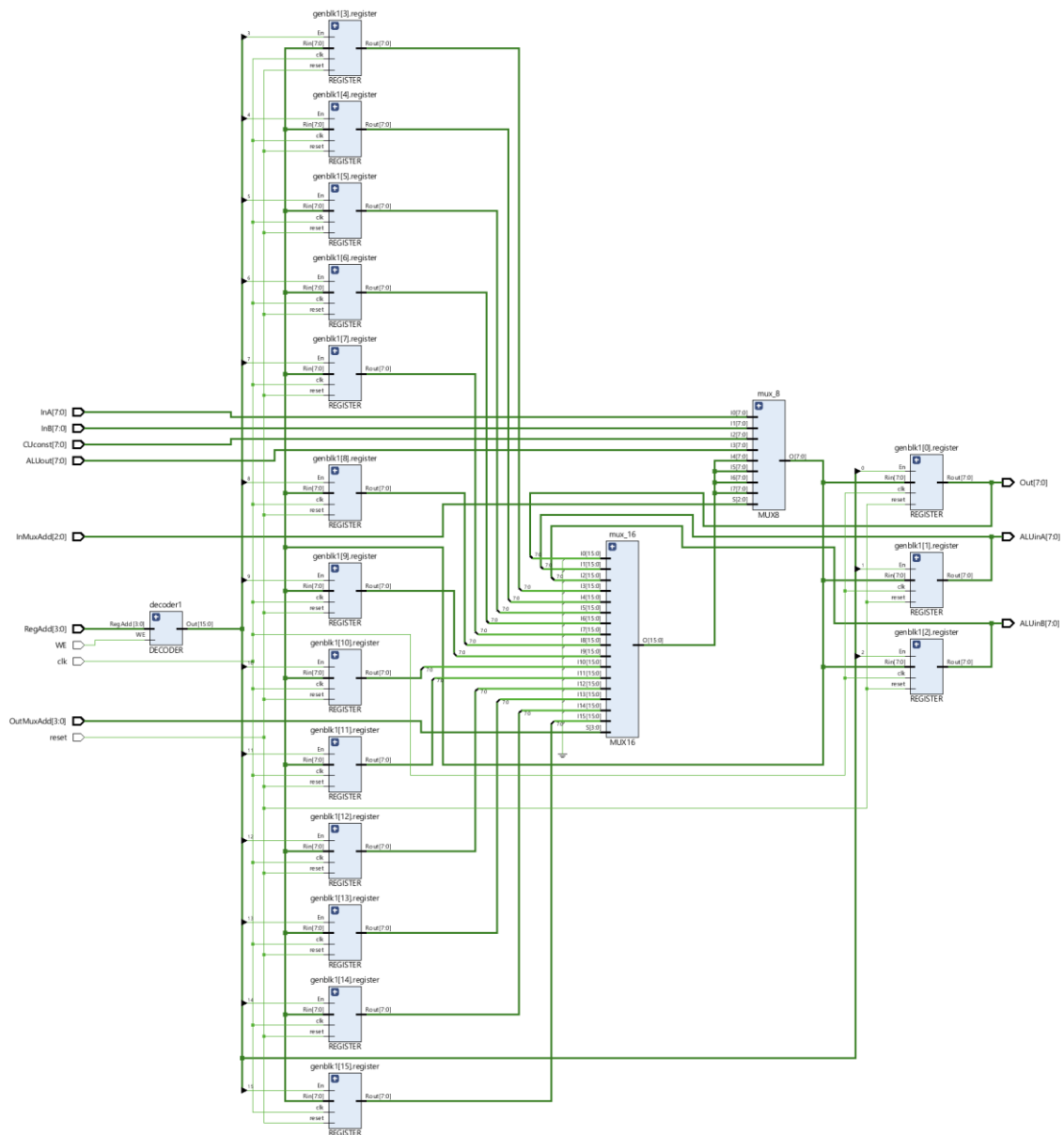
The control unit (CU) is a component of a computer's central processing unit (CPU) that directs the operations of the processor. It fetches instructions from memory, decodes them to determine the operation to be performed, and then coordinates the execution of that operation by activating the appropriate circuits within the CPU. The control unit acts as the "brain" of the CPU, constantly monitoring the state of the computer and making decisions about what actions to take next. It also manages the flow of data between the various components of the system, including the memory, the input-output devices, and the arithmetic logic unit (ALU). The control unit reads the instruction from memory, interprets it and then generates the control signal that tells the other parts of the CPU what to do next



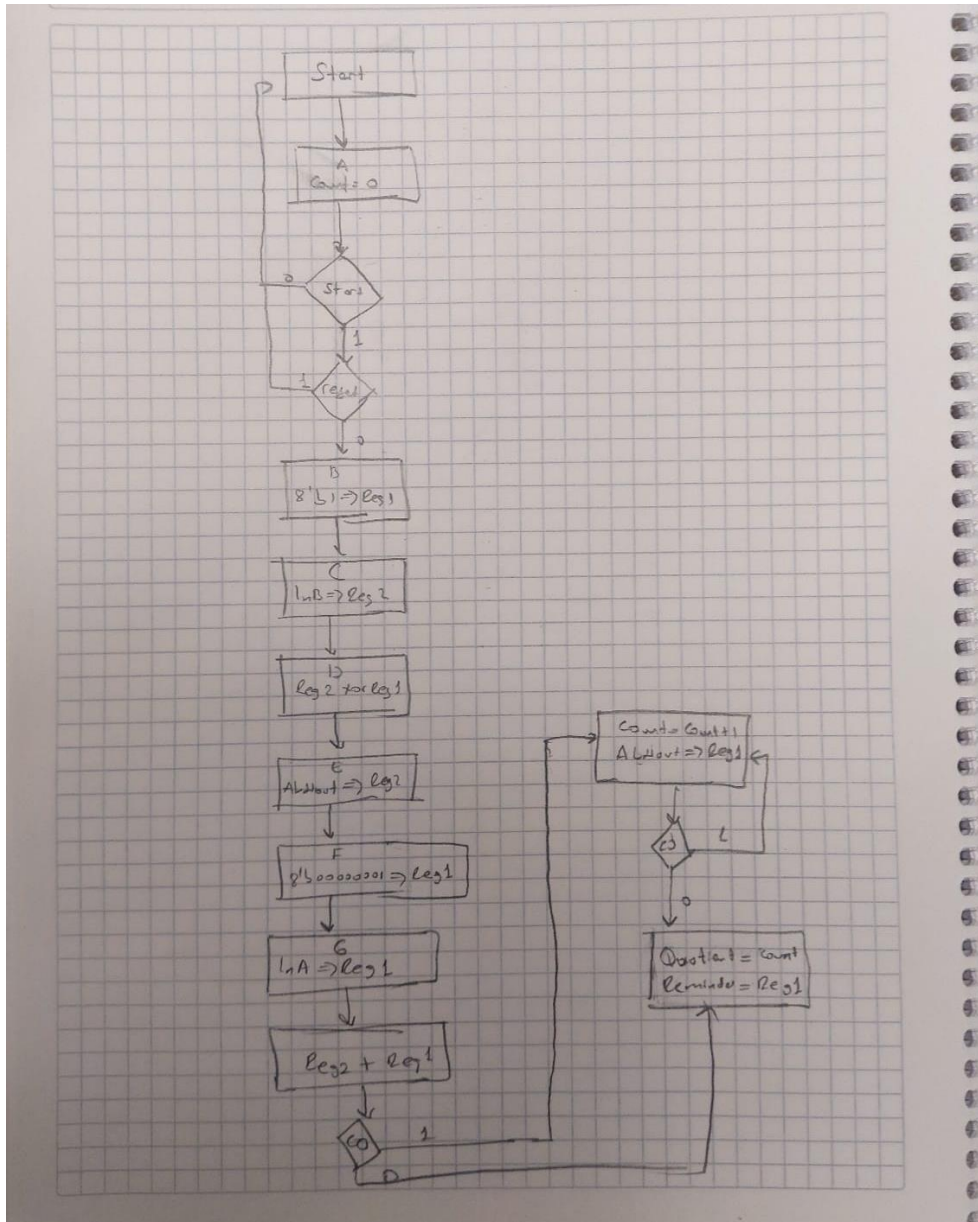
REGISTER BLOCK

A register block is a section of memory in a computer or other digital device that is used to store data that is frequently accessed or manipulated by the processor. Registers are typically located within the processor itself, and are used to store information such as the current instruction being executed, the current value of a particular calculation, or the location of data in memory. Because registers are located within the processor and can be accessed much more quickly than other types of memory, they are often used to speed up the execution of programs and improve overall system performance.

Register Block module RTL diagram

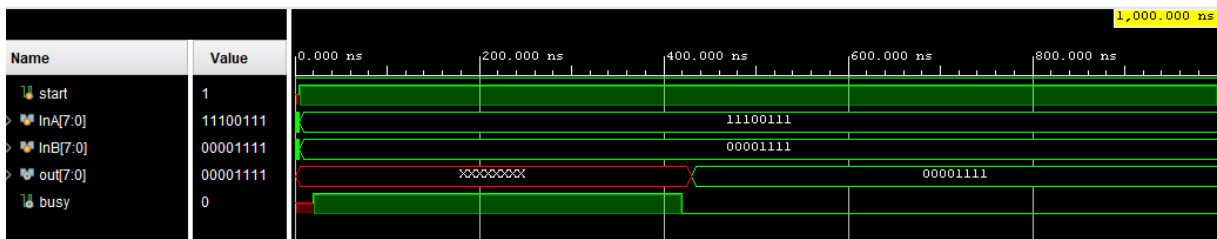


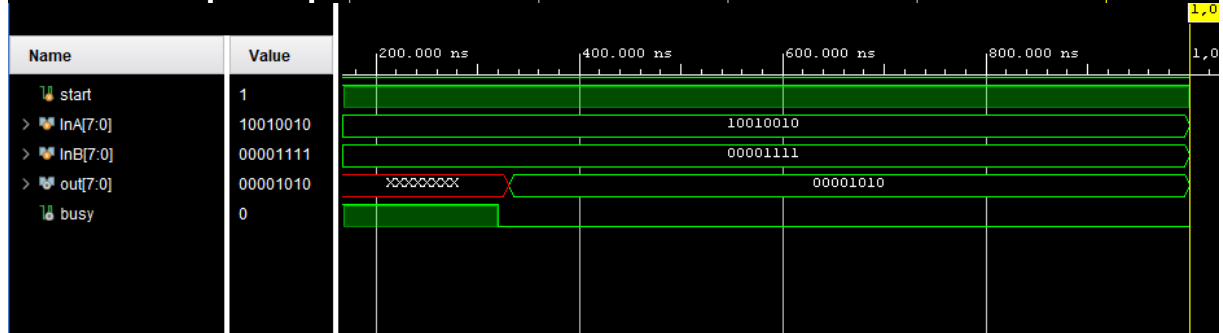
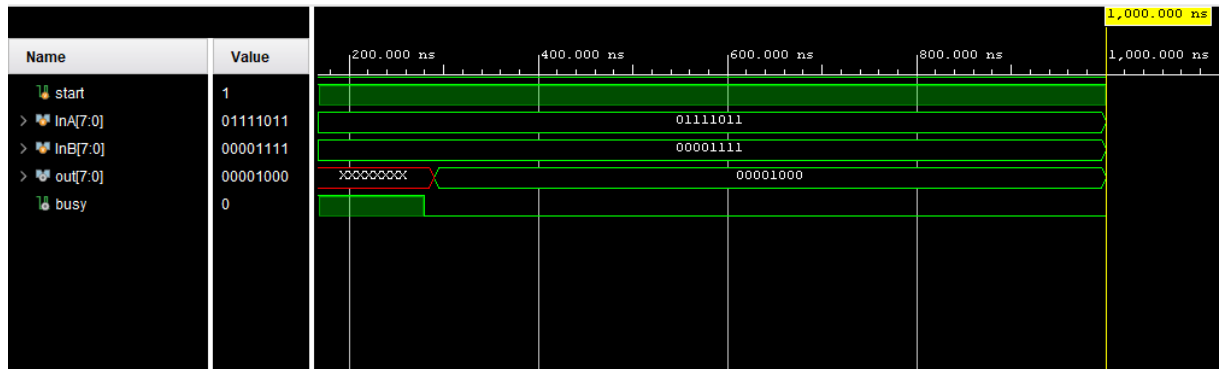
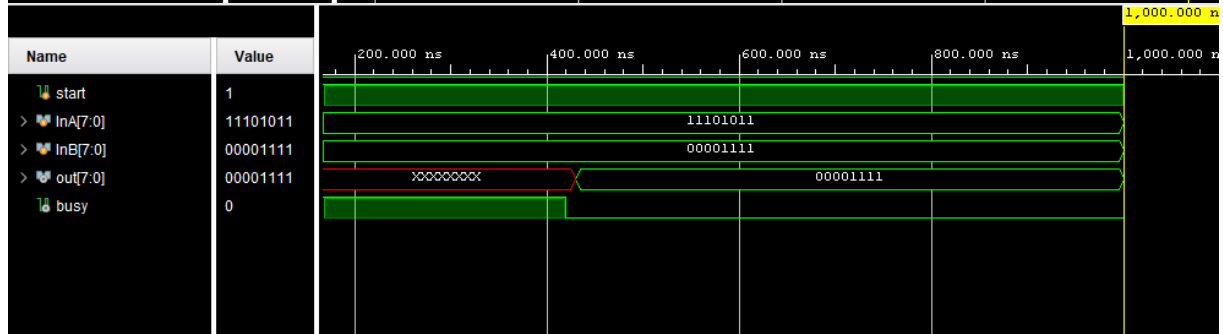
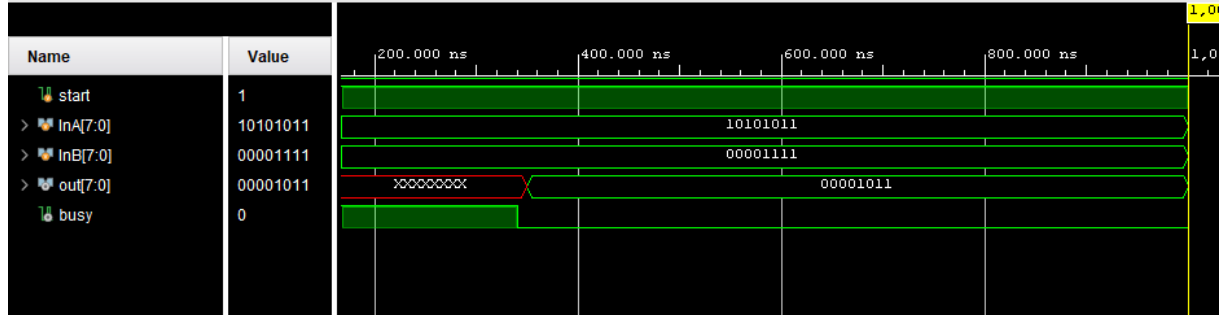
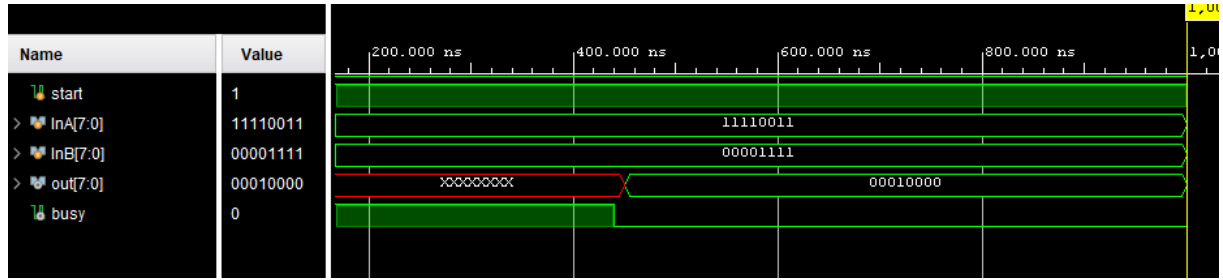
ASM

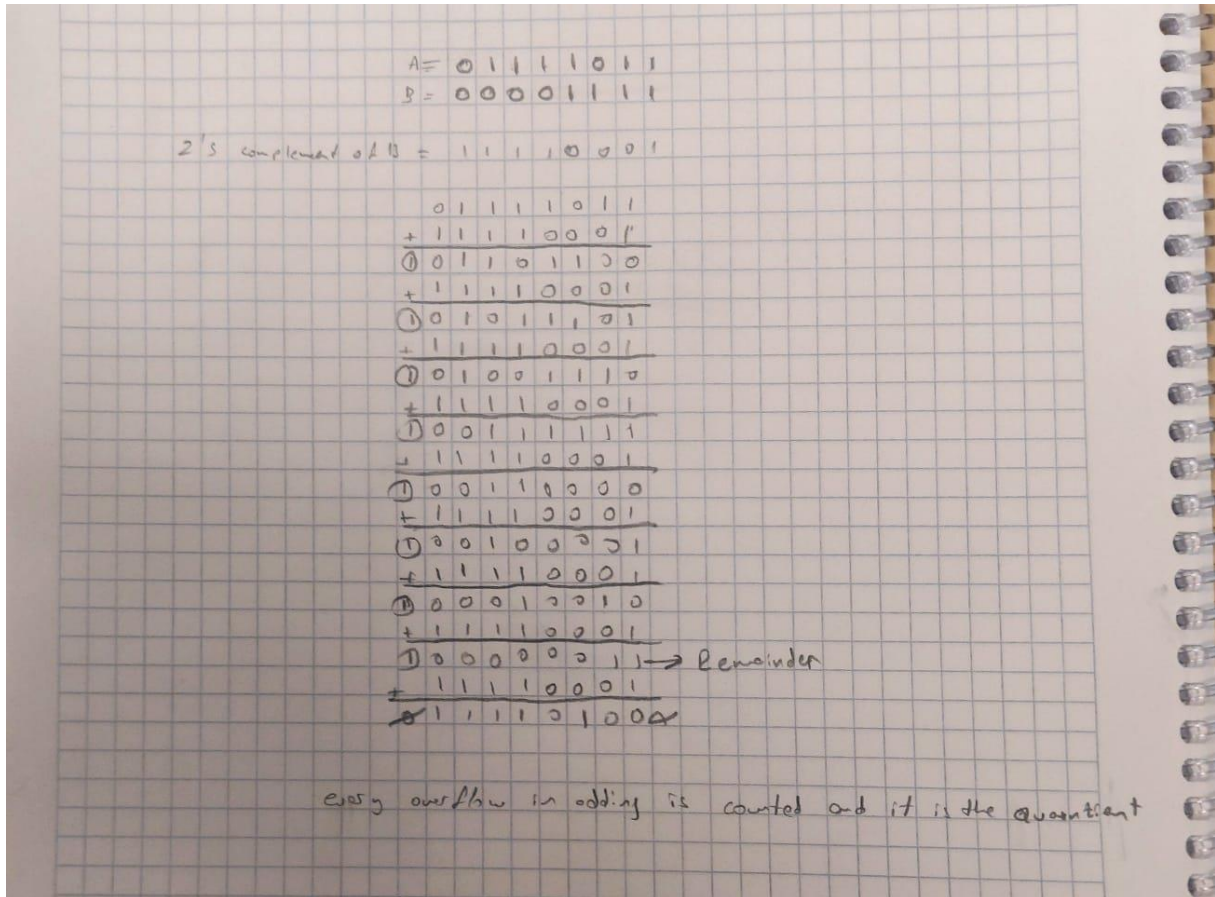


BEHAVIORAL SIMULATION

Wave form







Comment

This finite state machine works correctly but there is some situations that it shows one more then it should result. Remainder is stored in register1 but it is one step further so . I noticed too late that there should not be any register in control unit except state and output registers but it can be stored in register3 in register block instead of counter register in control block. The last wave form shows the incorrect result that ot results one more then it should be. After the wave i showed a hand calulated division logic that i used in this circuit.

TASK DISTRIBUTION

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SOLUTION AND ASM	WRITE TOP MODULE
WRITE CONTROL UNIT	WRITE TESTBENCH
WRITE ALU	WRITE REGISTER BLOCK
PREPARE REPORT	PREPARE REPOT