SystemC & Behavior Coding

Assignment 7, 2024-12-19

Abstract

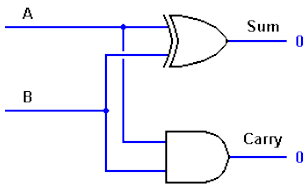
Implement a half-adder. Then use two (2) half-adders to implement a full adder.

Please read carefully. All outputs required are described in the text. Five (5) points will be taken for each bug, missing required output and behavior.

The half-adder `SC_METHOD` module

Description

1. A half-adder schematic is given below

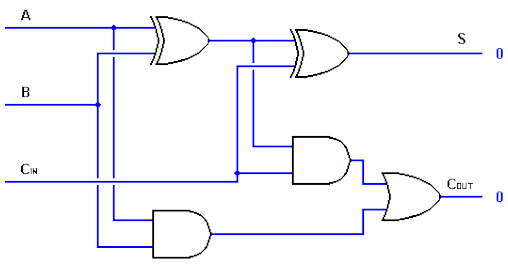


2. Use above schematic as the specification and implement a `SC_MODULE` with a `SC_METHOD` process, for which the module must be named as `HalfAdder`. All input and output ports must be named exactly the same as in the schematic.
3. You must name the SystemC files as `HalfAdder.h` and `HalfAdder.cpp`. This is to make it easier to compile your code using my makefile. Fail to do so will be penalized with 5 pts.

The full-adder `SC_METHOD` module

Description

1. A full-adder schematic is given below



2. Use above schematic as the specification and implement a `SC_MODULE` with a `SC_METHOD` process, for which the module must be

named as `FullAdder`. You must instantiate two (2) half-adders developed above to implement this full-adder. Again, all input and output ports are named exactly the same as in the schematic. C_{in} should be named as `Cin` and C_{out} should be named as `Cout`.

3. You must name the SystemC files as `FullAdder.h` and `FullAdder.cpp`. Fail to do so will be penalized with 5 pts.

sc_main

Description

1. Create two test suites in one `sc_main`, and you must name the file `main.cpp`, that
    - Instantiate both half-adder and full-adder modules
    - Provide all possible combinations to these modules, i.e. 4 input vectores to the half-adder and 8 input vectors to the full-adder.
2. Create a trace file named `RESULT.vcd`. And trace ports are shown in the following order:
    - Half-adder `A`
    - Half-adder `B`
    - Half-adder `Sum`
    - Half-adder `Carry`
    - Full-adder `A`
    - Full-adder `B`
    - Full-adder `Cin`
    - Full-adder `S`
    - Full-adder `Cout`

makefile

Description

A `makefile` must be provided, with proper modifications to your environment.

Using Generative AI

It is encouraged to use Generative AI (GAI) to solve the problem as in earlier assignments. If you use GAI to solve the problem, sorry that I am out of ideas for you to create other combinational circuits, LOL.

Please turn in the `HalfAdder` and `FullAdder` source codes and main.cpp described in the **sc_main** section only and the `makefile`. Do not turn in the executable and waveforms.

Due date
3:00 PM, December 26th, 2024

Score weight (towards the final grade) 10%