SystemC & Behavior Coding

Assignment 7, 2025-12-11

Abstract

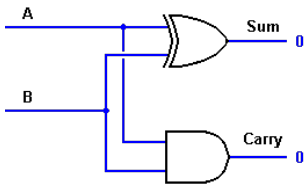
Implement a half-adder. Then use two (2) half-adders to implement a full adder.

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

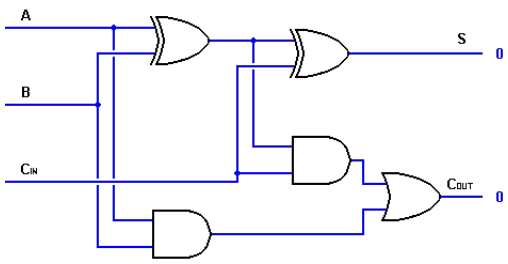


2. Use above schematic as the specification and implement a `SC_MODULE` with a `SC_METHOD` process, for which the module must be named as `HalfAdder`. All input and output ports must be named exactly the same as in the schematic.
3. You must name the SystemC files as `HalfAdder.h` and `HalfAdder.cpp`. 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 vectors 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 GenAI

Please utilize the code generator AI to generate both the `HalfAdder` and `FullAdder` modules. Though GenAI is likely to generate correct `SC_METHOD` processes, please verify carefully and fully to confirm these two modules are correctly implemented.

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 17th, 2025

Score weight (towards the final grade) 10%