Digital Design & Computer Arch.

Lab 3 Supplement:
Verilog for Combinational Circuits

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Spring 2024

[19. March 2024]

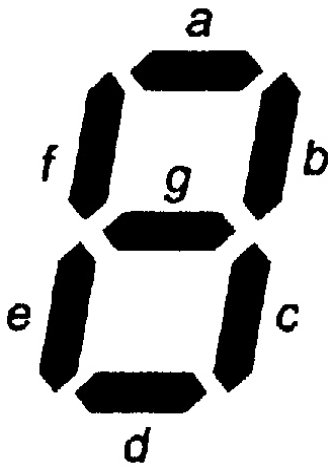
What Will We Learn?

- In Lab 3, you will design more combinatorial circuits.
- Convert a binary number to 7-Segment display encoding.
- Implement a circuit to drive the 7-Segment display.
- Show the addition result on the 7-Segment display.

7-Segment Display

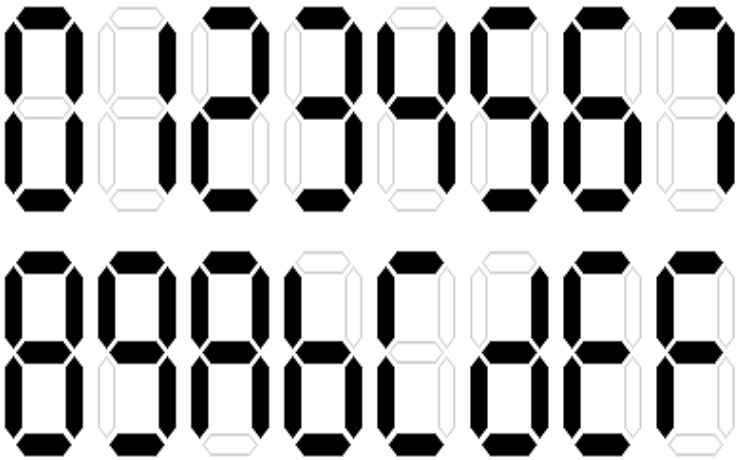
- A 7-segment display consists of seven separate LEDs in a single package.

- Each of the seven segments is labeled using the letters a, b, c, d, e, f, g.



Representing Different Numbers

- We can represent different characters or digits by making particular segments glow at the same time.



Binary Number to 7-Segment Encoding

- As a first step, you will complete the truth table for converting a 4-bit number to a 7-segment encoding.

- Note: A segment glows when the corresponding output is set to logic-0.

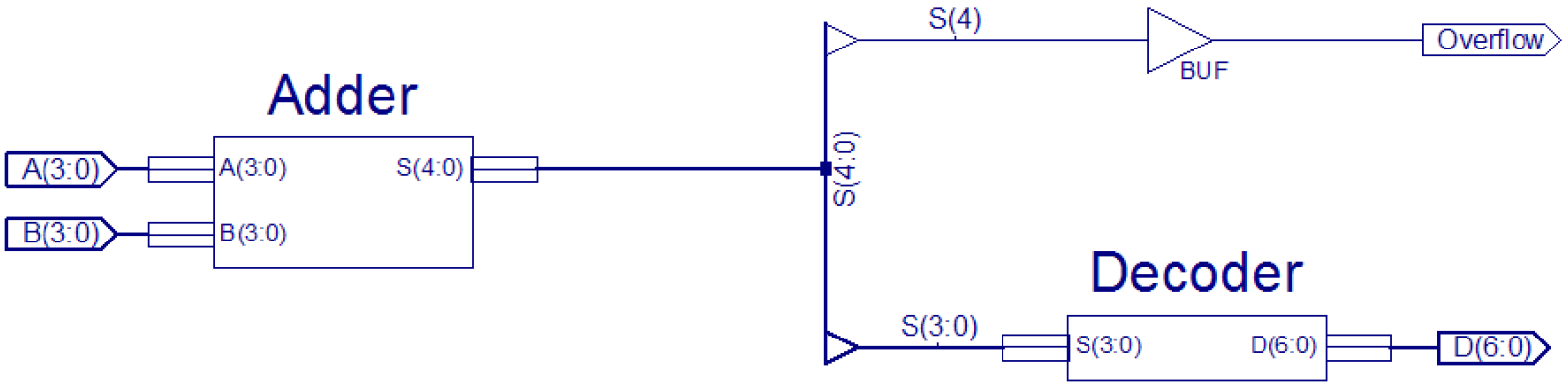
Drive the 7-Segment Display

- Design a "decoder" that receives a 4-bit input and returns a 7-bit output signal, and converts a binary number to a 7-segment display encoding.

- Make sure to use behavioural modelling instead of explicit gate-level modelling.

Show the Results of the Addition

- Show the result of our adder circuit from Lab 2 using the 7-segment display. You need one overflow bit to be displayed on an LED.
- Attach an instance of the decoder to the output of the adder.



- Hint: Create a new "top" module that will create an instance of each module and make appropriate connections between them.

Decoder

- You do not use gate-level implementation.

- Instead of gates use behavioural modeling.

switch/case Statements

`switch/case` statements execute one of several statements depending on the conditions, as shown in the general format below.

```
switch (variable) {
   case (expression1): statement1 break;
   case (expression2): statement2 break;
   case (expression3): statement3 break;
   default:            statement4
}
```

Behavioural implementation

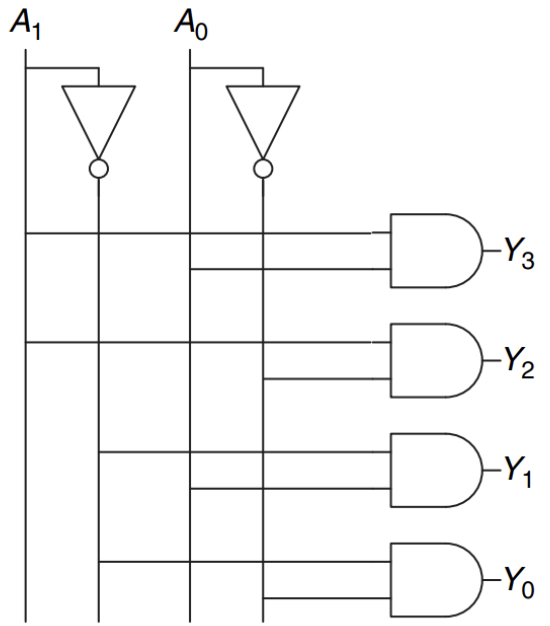


Figure 2.64 2:4 decoder implementation

Gate-level implementation

Last Words

- In Lab 3, you will design more combinatorial circuits.
- Convert a binary number to 7-Segment display encoding.
- Implement a circuit to drive the 7-Segment display.
- Show the addition result on the 7-Segment display.
- In the report, you will learn how to display the addition result using only a single 7-segment display.

Report Deadline

[19. April 2024 23:59]

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[27. Feb 2024]