

DIGITAL TECHNICS I

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12. LECTURE: DESIGN CASE STUDY: MODEL ARITHMETIC LOGIC UNIT (ALU)



1st year BSc course 1st (Autumn) term 2018/2019

1

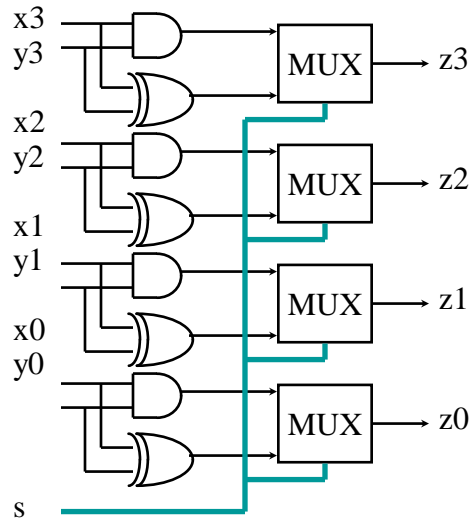
DESIGN CASE STUDY: ARITHMETIC LOGIC UNIT

Design case study: *model arithmetic logic unit (ALU)*

The ALU is in the heart of microprocessors. Its function and role is to perform all logic and arithmetic operations.

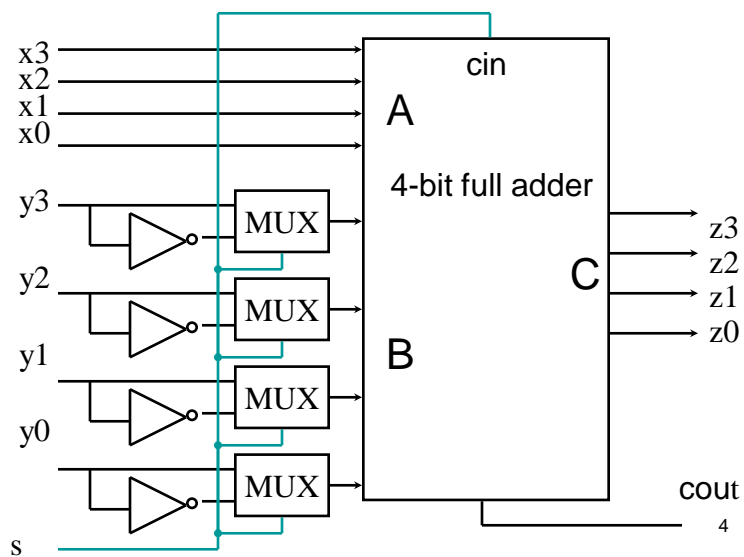
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PRELIMINARIES: 4-BIT LOGIC FUNCTION (AND, XOR) CIRCUIT

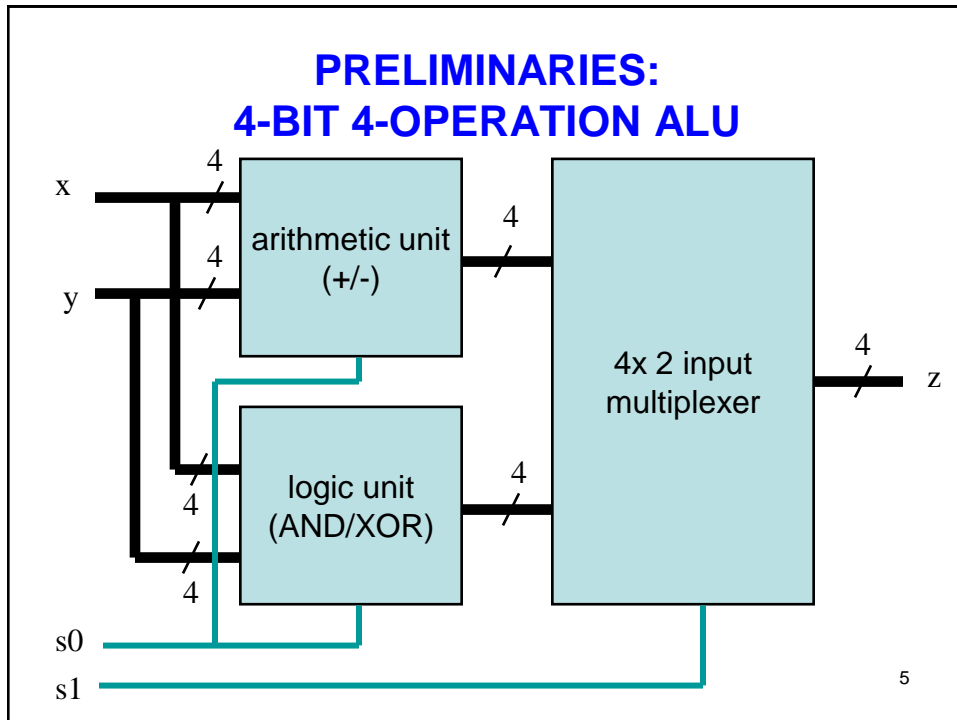


3

PRELIMINARIES: 4-BIT ADDER/SUBTRACTOR CIRCUIT



4

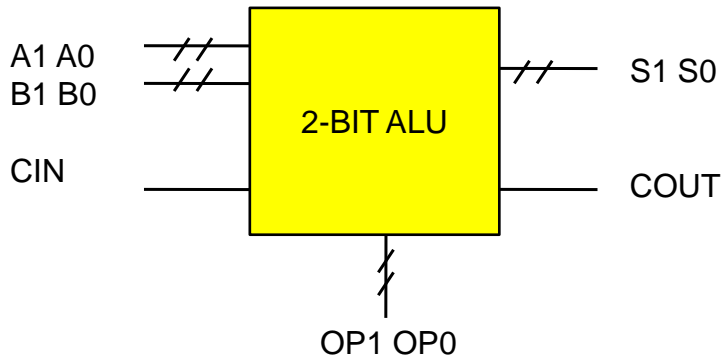


DESIGN WITH FUNCTIONAL BLOCKS: A CASE STUDY

Design a simple four-operation model ALU, capable of performing three logic (XOR, AND, OR) and one arithmetic (SUM) operation on two 2-bit numbers/words. The output is a 2-bit number/word with an additional output for the arithmetic carry-out, and it should also have carry-in input to facilitate the cascading of units to handle longer numbers/words.

Let's design it from "scratch"!

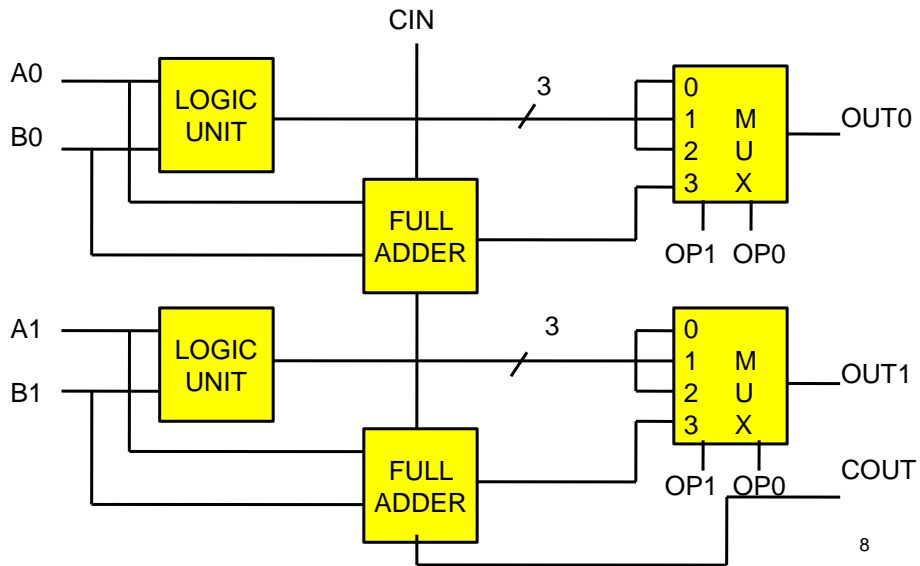
2-BIT ARITHMETIC LOGIC UNIT



2-bit ALU conceptual diagram

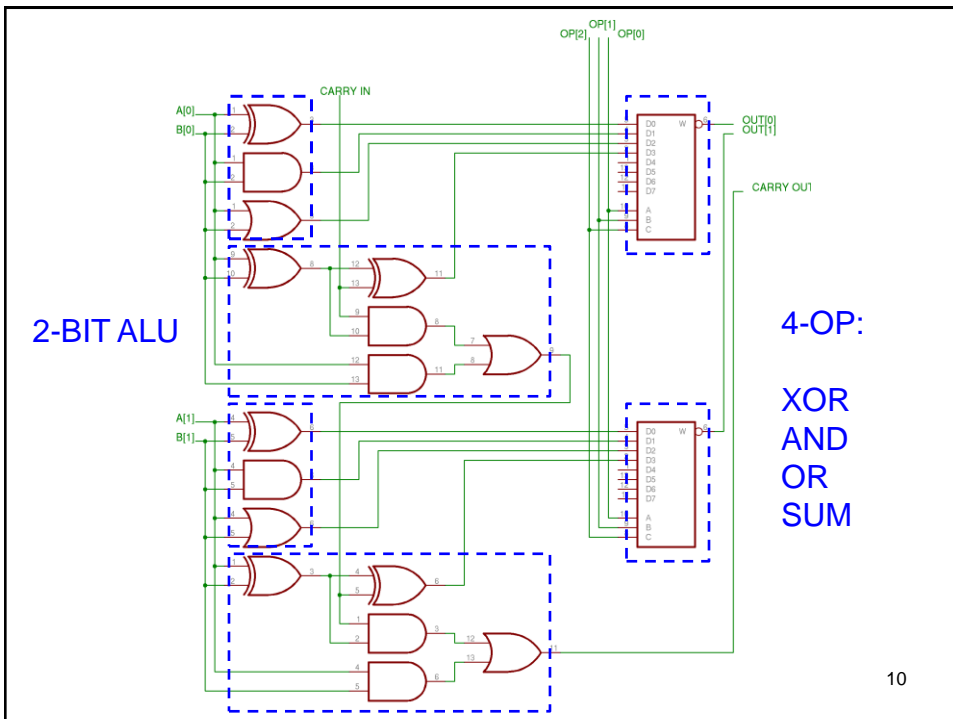
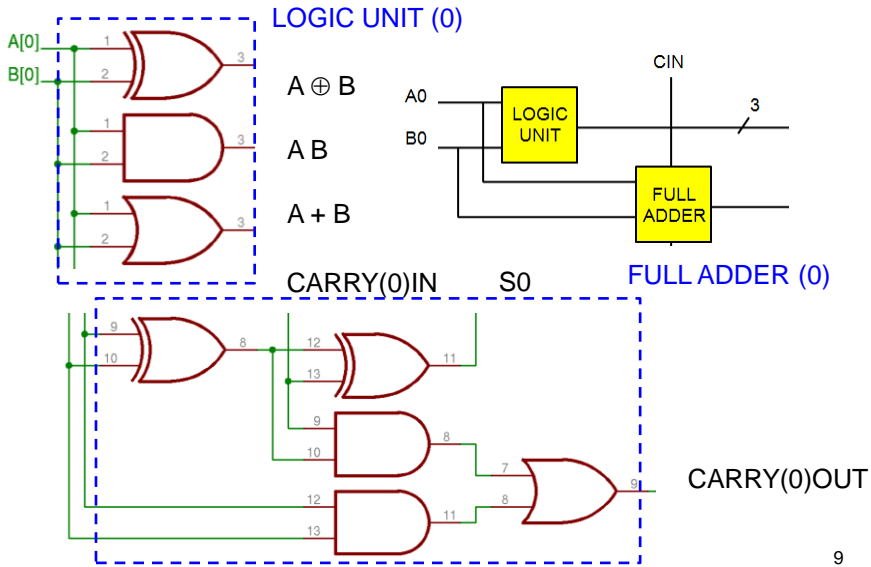
7

2-BIT ARITHMETIC LOGIC UNIT FUNCTIONAL DIAGRAM

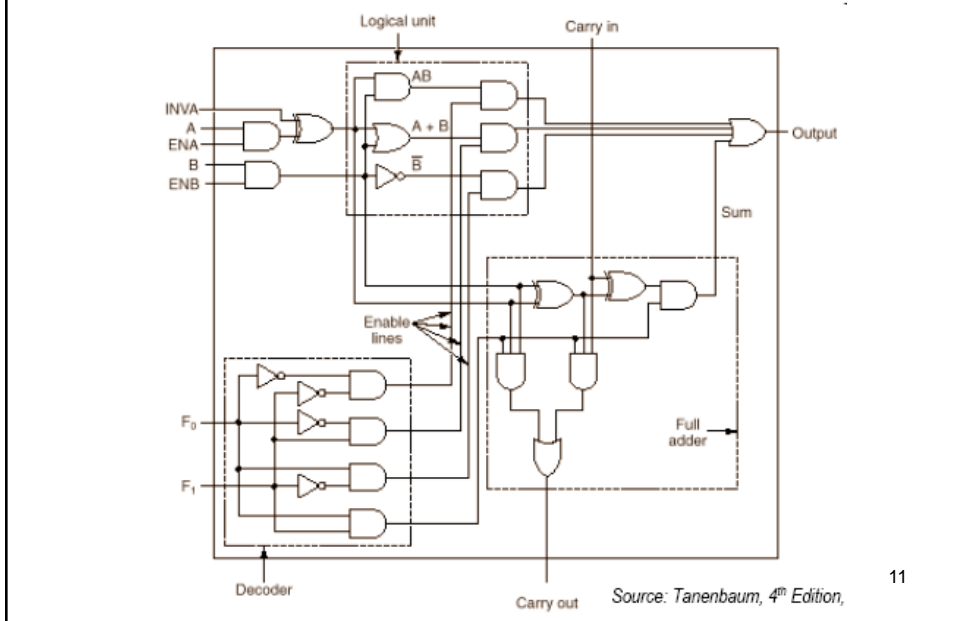


8

2-BIT ALU GATE LEVEL CIRCUITS



OTHER EXAMPLE: DECODER IN 1-BIT ALU



ARITHMETIC LOGIC UNIT (GENERAL) FUNCTIONAL DIAGRAM

