University of California, Berkeley
College of Engineering
Computer Science Division — EECS

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Homework Quiz (HW #3)

SOLUTION

October 3rd 2001

CS152 Computer Architecture and Engineering

This quiz covers one of the problems from homework #3.
Good Luck!

Your Name:	
SID Number:	
Discussion Section:	

Total:	

Combinational Multipliers built with Carry Save Adders

In your homework, you learned about using Carry Save Adders to perform multiplication. Below we review using carry save adders to add four 3-bit numbers to produce a single 5-bit number:

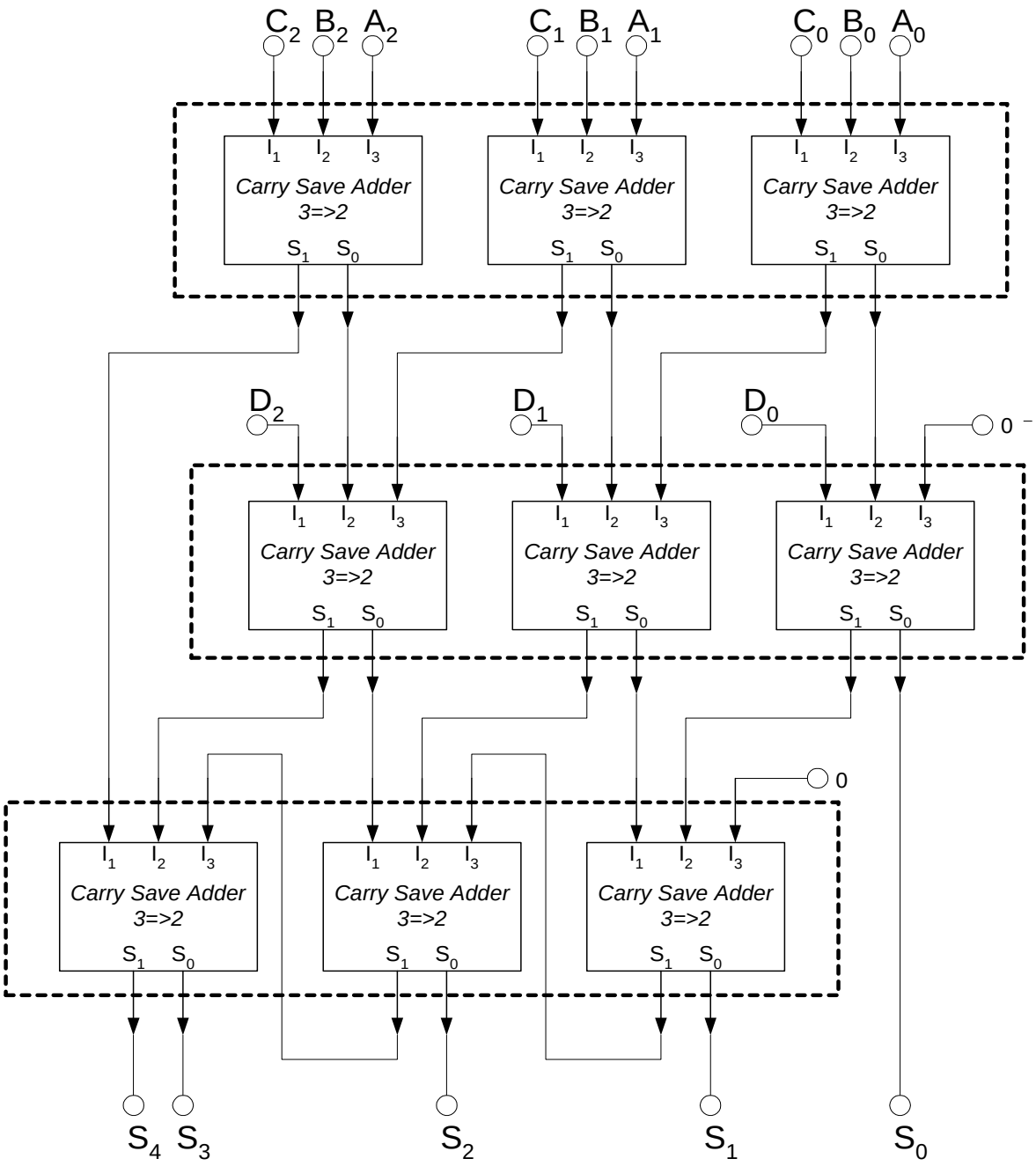
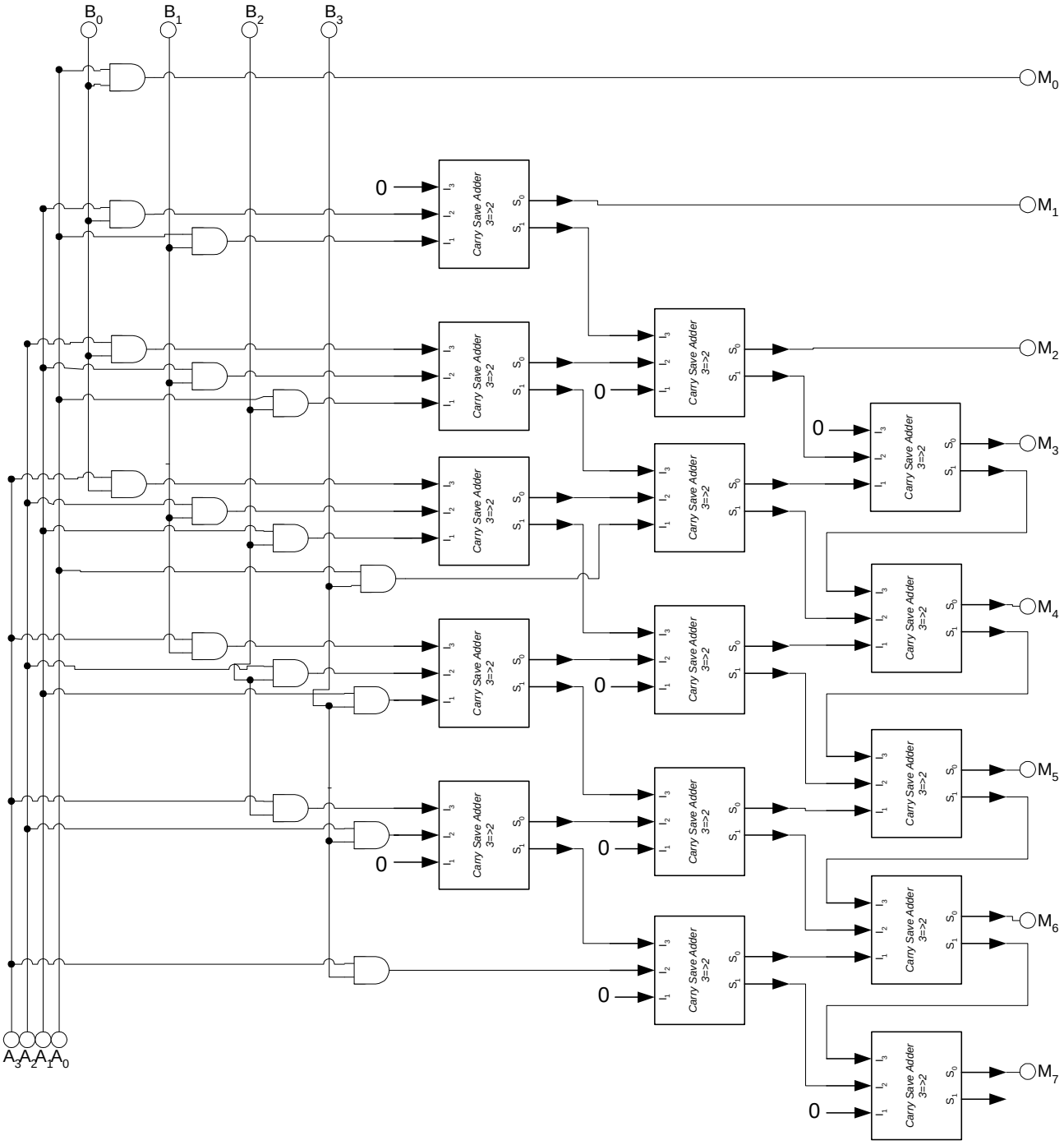


Figure 1: Adding four 3-bit numbers with carry-save adders.

1. Draw a complete 4 x 4 multiplier that takes two four-bit numbers (call the input bits A3…A0 and B3…B0), and which outputs an 8-bit result (M7 … M0). Use a carry-save architecture for this, use as little hardware as possible, and *assume that the numbers are unsigned*:



2. Is there any way to use an architecture like this for signed numbers? Give *short* explanation.

Not without some modification. One option would be to check the signs first, negate any negative numbers, then fixup the result afterwards. Another would be to sign-extend the A input at each level (adding requisite additional adders). Note that we cannot allow the B input to be negative, however.