



BIOE40002 – Computer Fundamentals and Programming 1

Part I – Digital Logics, Lab 4

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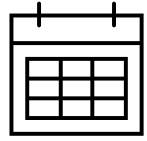
Meme of the day...

Normally



when you begin to
explain what a clock is





Today's Schedule

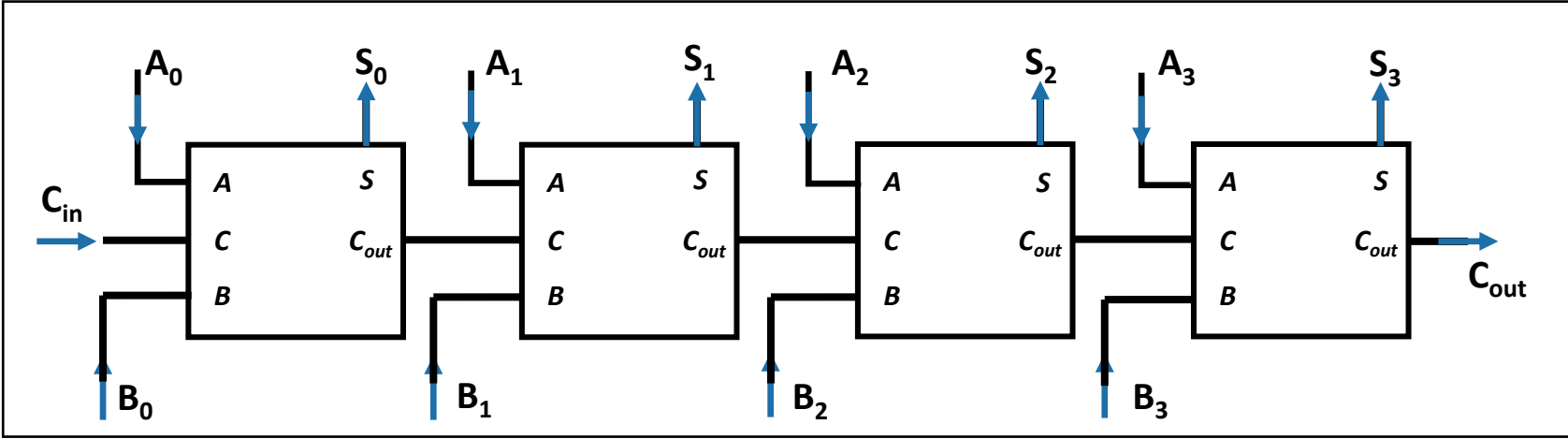
- Recap (~ 10 mins)
 - Integration of the 4-bit addition and subtraction machine
- Lab exercises 10 and 11

Schedule from next week onwards...

- Week 6 & 7 (reading week) – digital logic
- Week 8 to 11 – programming

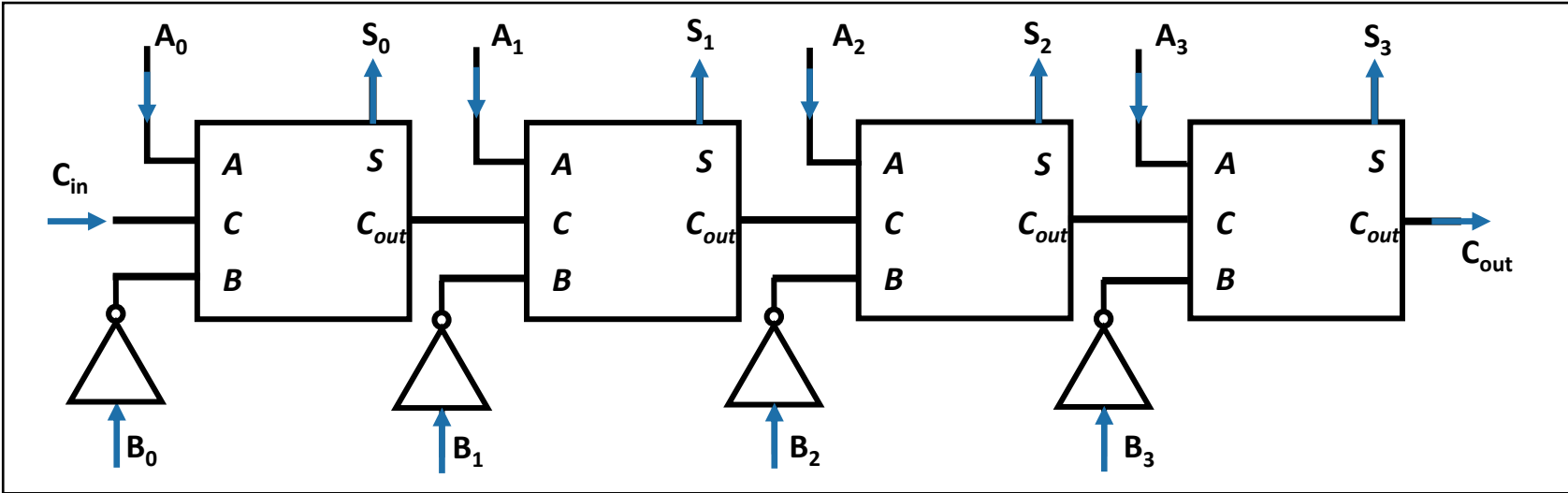
4-bit addition and subtraction machine

- Q: can we integrate addition and subtraction functions into *one* machine?



4-bit addition machine

- performs addition $A+B$



4-bit subtraction machine

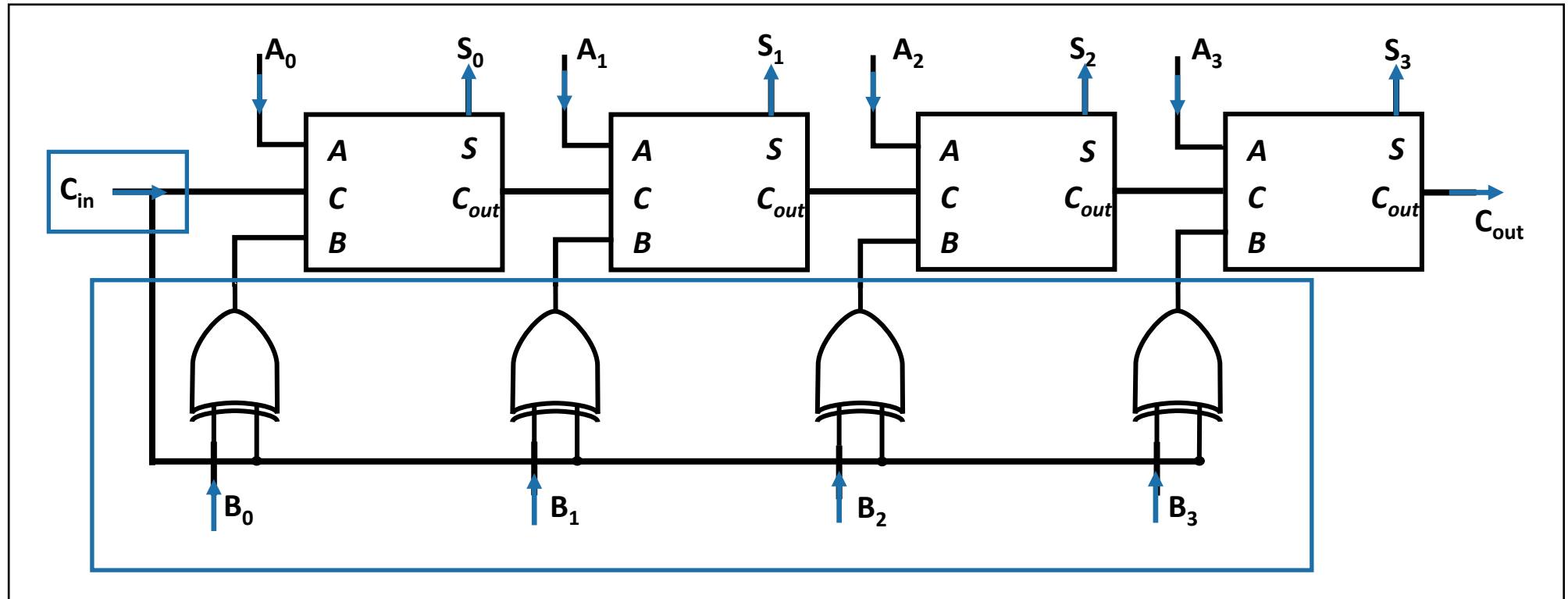
- invert each bit of input B
- performs subtraction $A+(-B)$

4-bit addition and subtraction machine

- **Q:** can we integrate addition and subtraction functions into *one* machine?
- **Rationale:** a condition to determine whether inverting the input bits is required!

$C_{in} = 0$,
addition

$C_{in} = 1$,
subtraction

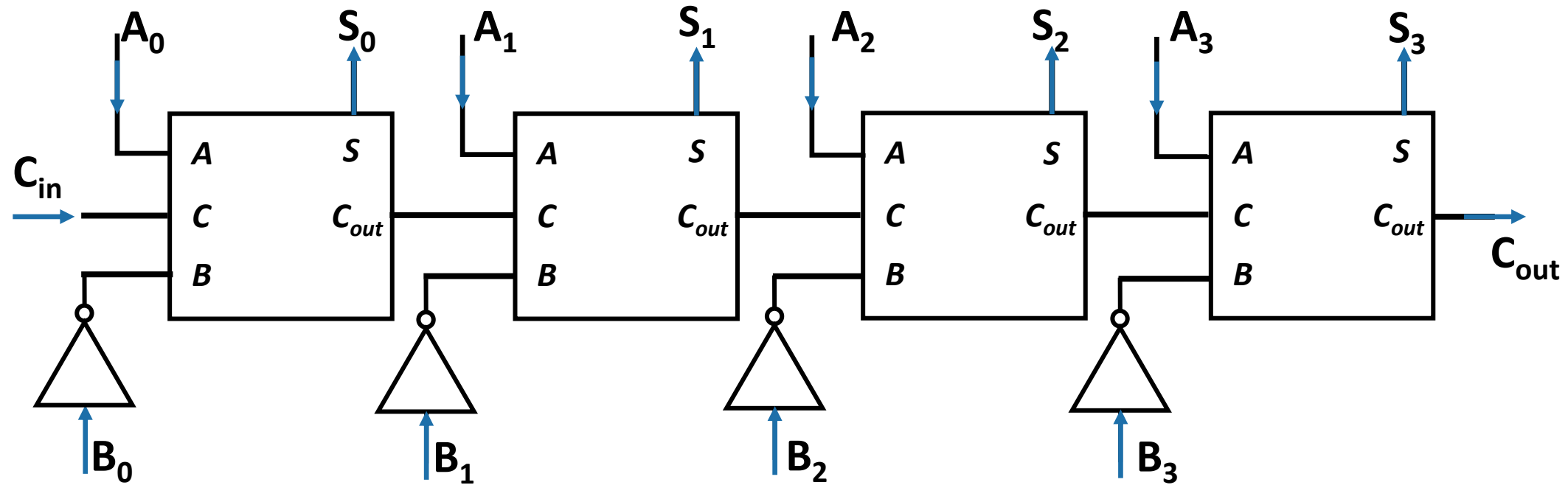


Questions ?

That's it for now.

You can now proceed to the Exercise 10 and 11.

Task 10 - design a 4-bit subtraction circuit

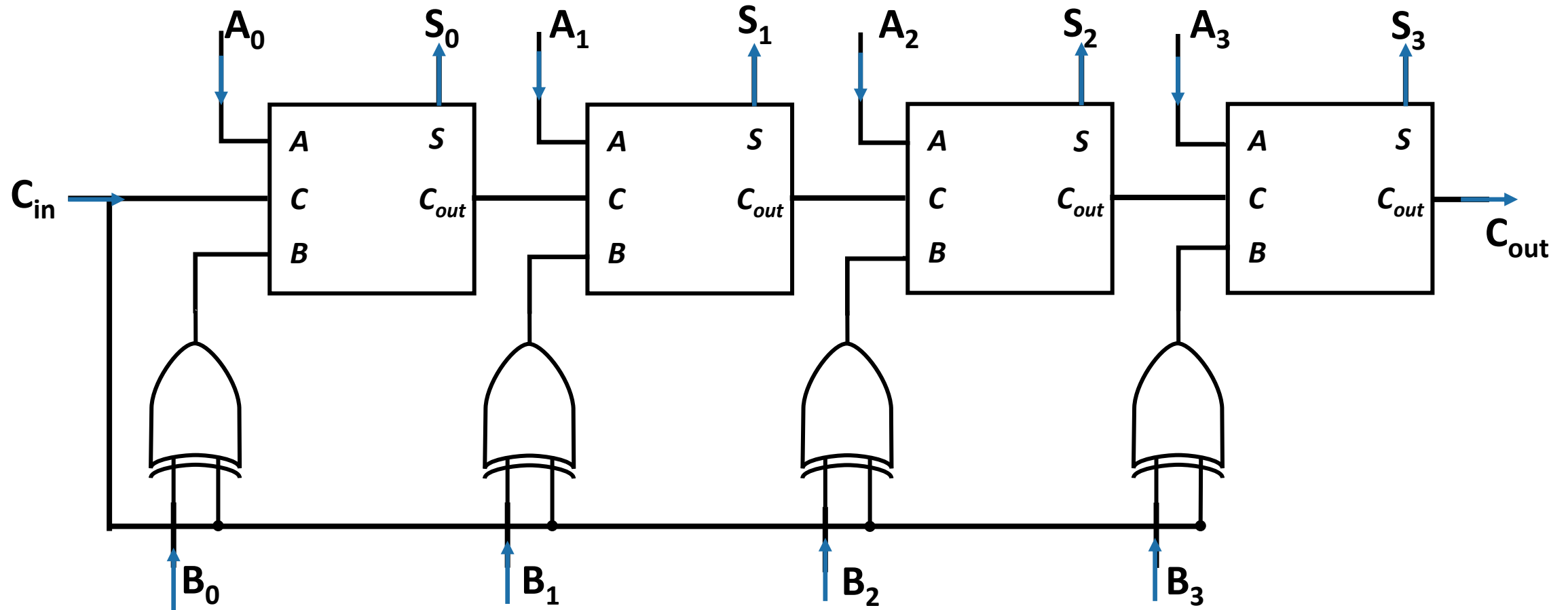


- The 4-bit subtraction circuit is obtained by inverting four B inputs.

- Verification:

	Name	Value at 0 ps
if	> A	B 1101
if	> B	B 0010
in	Cin	B 0
out	Cout	B 1
out	> S2	B 1010

Task 11 – design a 4-bit add-subtraction circuit



- By setting $C_{in} = 0$, the circuit performs addition
- By setting $C_{in} = 1$, the circuit performs subtraction