

ECE 190 - Homework 2 Solutions

3.13.

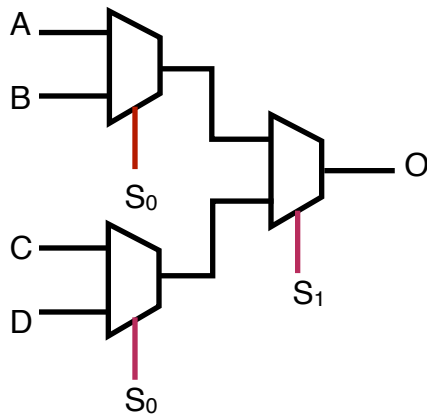
Number of output lines = $2^5 = 32$

3.14

Multiplexers always have only one output line.

A 16-input MUX will have $\log_2 16 = 4$ select lines

3.22.



S ₀	S ₁	O
0	0	A
0	1	C
1	0	B
1	1	D

3.23.

All zeros

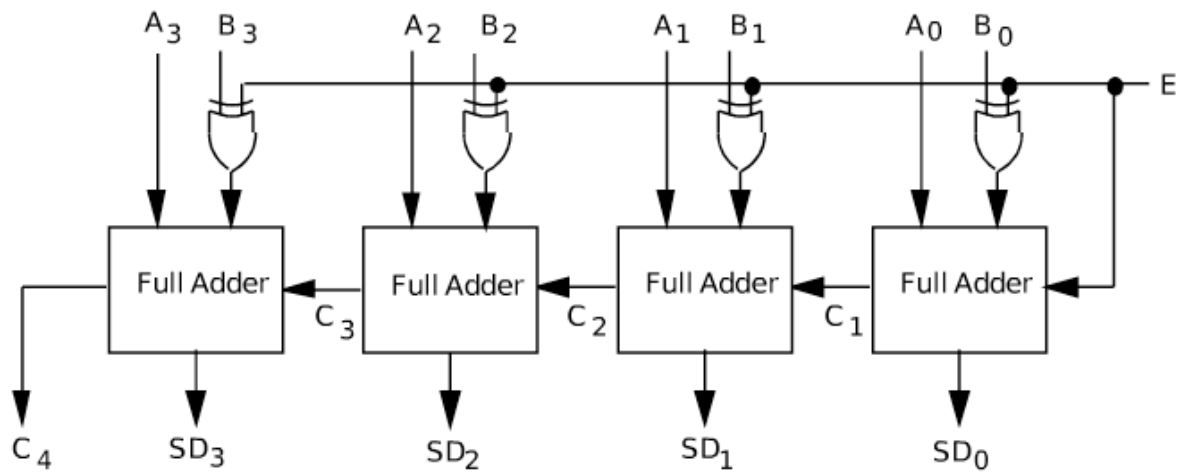
3.24.

a. The wire X acts as the control line to choose the input to be either B or C

If X = 0 then S = A+B

If X = 1 then S = A+C

b. The following diagram is the full-subtractor logic.



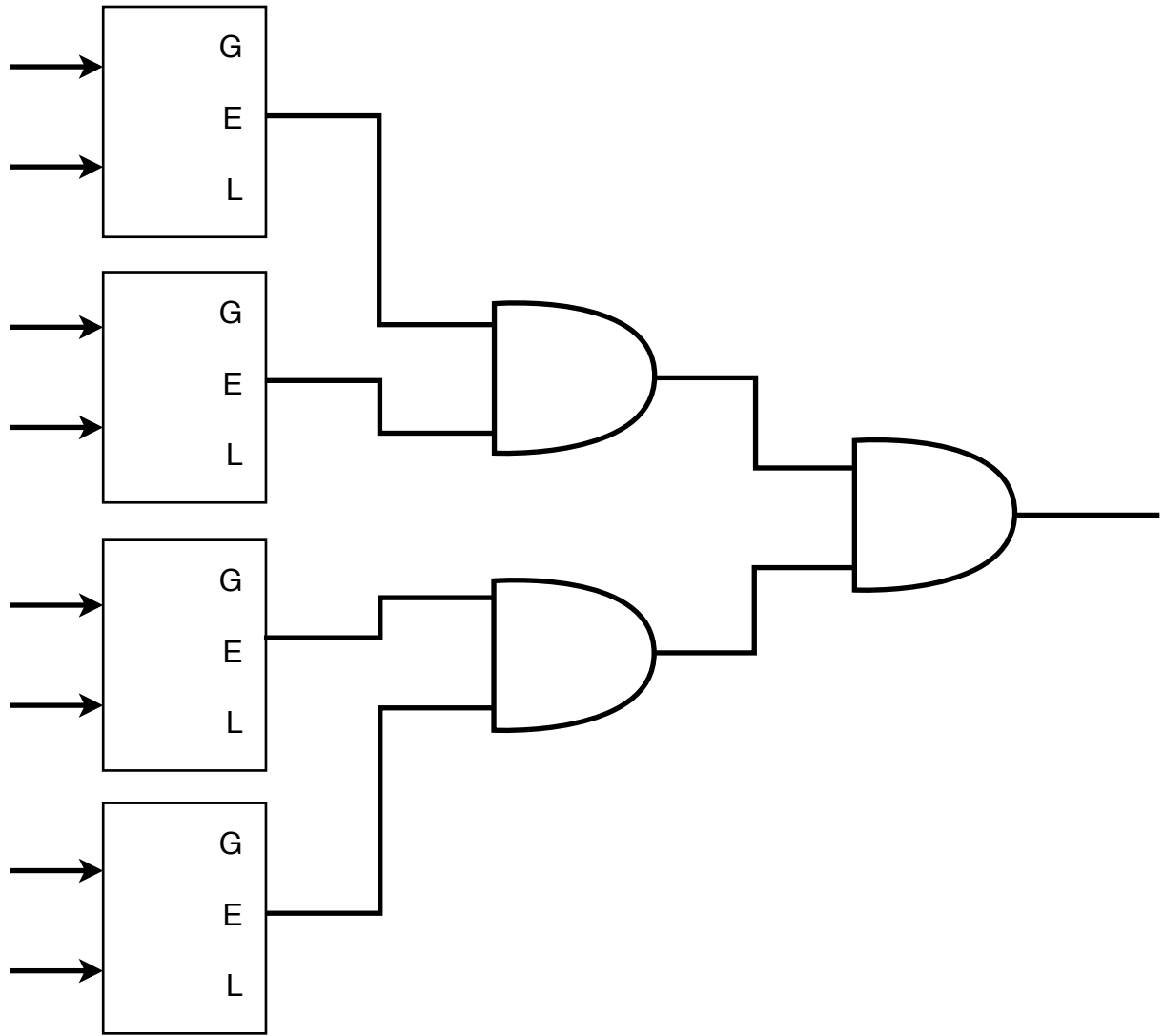
3.30.

a.

A	B	G	E	L
0	0	0	1	0
0	1	0	0	1
1	0	1	0	0
1	1	0	1	0

b. $G = \mathbf{A \text{ AND } NOT(B)}$
 $E = (\mathbf{NOT(A) \text{ AND } NOT(B)}) \text{ OR } (\mathbf{A \text{ AND } B})$
 $L = \mathbf{NOT(A) \text{ AND } B}$

c.



3.35.

Bits of storage = $2^{22} \times 3 = 12\,582\,912$ bits

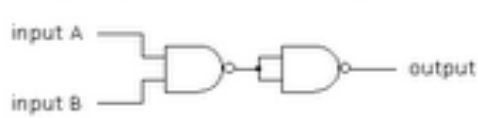
3.44

All gates (NOT, AND, OR, NOR, EXOR) can be built using the NAND Gate as shown in the diagram below

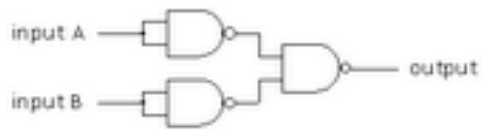
NOT gate (inputs joined together)



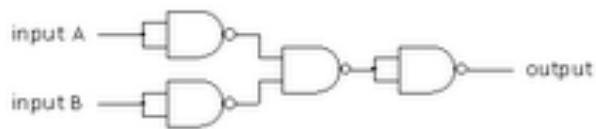
AND gate (NAND followed by NOT)



OR gate (NOT of each input followed by NAND)



NOR gate (OR followed by NOT)



EXOR gate

