Lab 3 CE100

Calculate sum or difference of two numbers represented in 8-bit 2's comp

a[7:0] = sw[7] to sw[0]

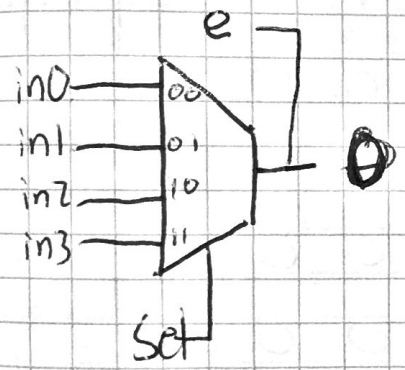
b[7:0] = sw[15] to sw[8]

~~btnU = sub~~

sub = btnU

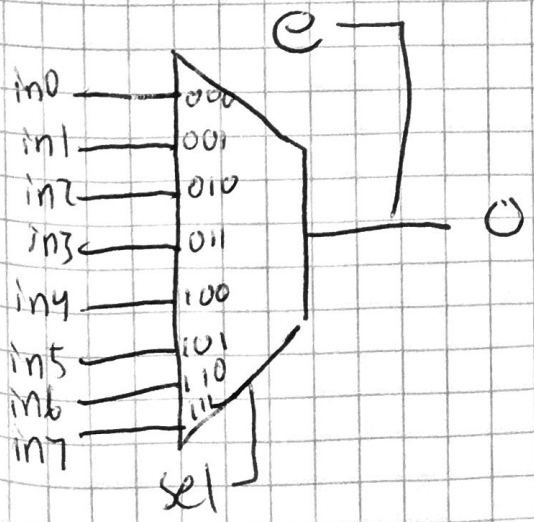
overflow = cdp

m4_1e in: in[3:0], sel[1:0], e
out: o



sel1	sel0	in3	in2	in1	in0	e	o
0	0	0	0	0	1	0	0
0	1	0	0	1	0	0	0
1	0	0	1	0	0	0	0
1	1	1	0	0	0	0	0
0	0	0	0	0	1	1	in0
0	1	0	0	1	0	1	in1
1	0	0	1	0	0	1	in2
1	1	1	0	0	0	1	in3

m8_1e in: in[7:0], sel[2:0], e
out: o



Lab3
7197

Truth table
on next pg

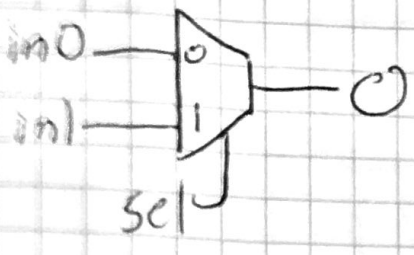
2:20 sw
20 out 20

m8-1e truth table

s2	s1	s0	in7	in6	in5	in4	in3	in2	in1	in0	e	o
0	0	0	0	0	0	0	0	0	0	1	0	0
0	0	1	0	0	0	0	0	0	1	0	0	0
0	1	0	0	0	0	0	0	1	0	0	0	0
0	1	1	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	1	0	0	0	0	0	0
1	0	1	0	0	0	0	0	0	0	0	0	0
1	1	0	0	1	0	0	0	0	0	0	0	0
1	1	1	1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	1	in0
0	0	1	0	0	0	0	0	0	1	0	1	in1
0	1	0	0	0	0	0	0	1	0	0	1	in2
0	1	1	0	0	0	0	1	0	0	0	1	in3
1	0	0	0	0	0	1	0	0	0	0	1	in4
1	0	1	0	0	1	0	0	0	0	0	1	in5
1	1	0	0	1	0	0	0	0	0	0	1	in6
1	1	1	1	0	0	0	0	0	0	0	1	in7

CE100 Lab 3

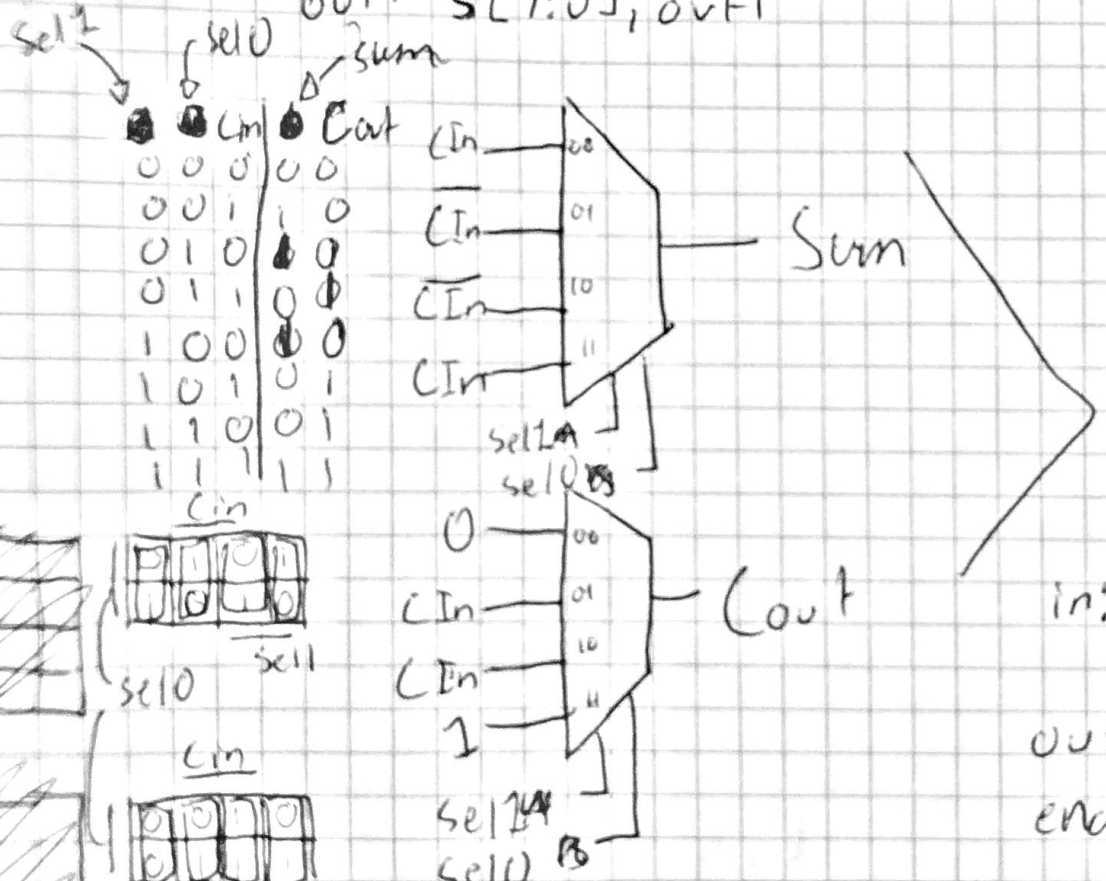
m2_1x8 in: in0[7:0], in1[7:0], sel,
out: o[7:0]



sign extend sel to be 8 bits

sel	in0	in1	o
0	1	0	0
1	0	1	0
			in0
			in1

AddSub8 in: A[7:0], B[7:0], sub
out: S[7:0], ovfl



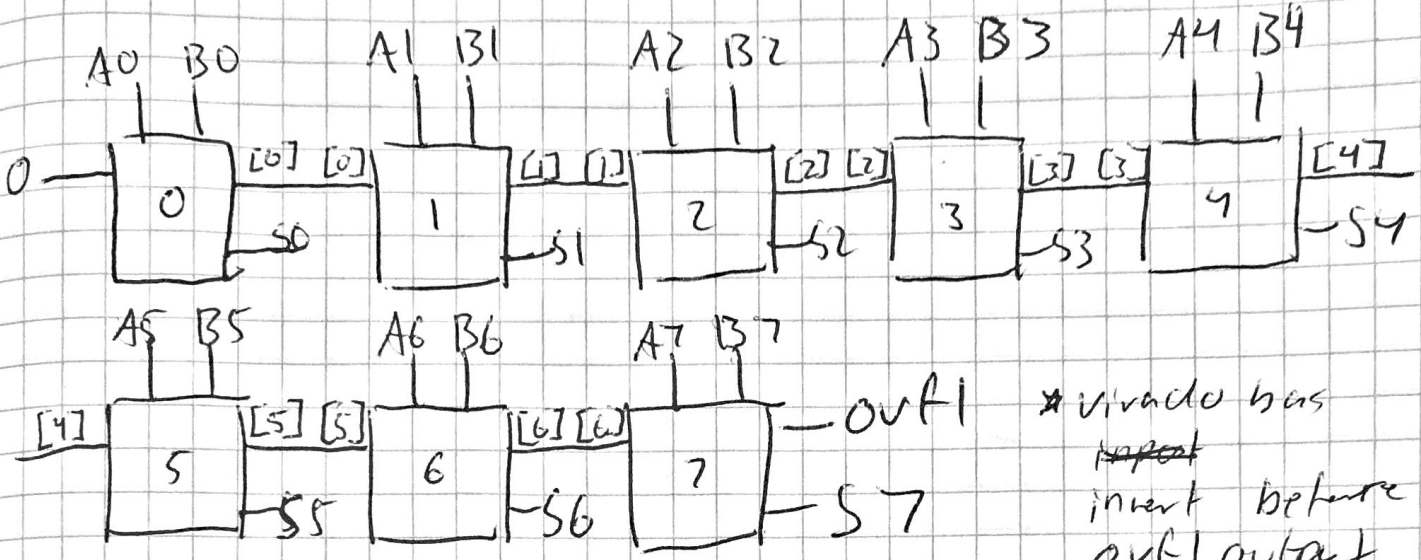
8 bit Adder implemented next page

Overflow logic

S[7]	A[7]	B[7]
1	0	0
0	1	1

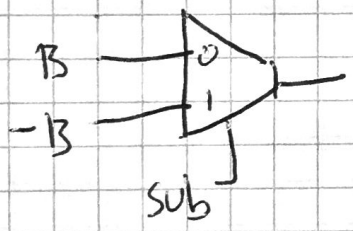
CE100 Lab 3

AddSub 8 bit adder B = Bsel



* vivado has ~~input~~ invert before ovfl output

AddSub 8 m2_1x80



me hex7seg in: n[3:0], c
out: seg[6:0]

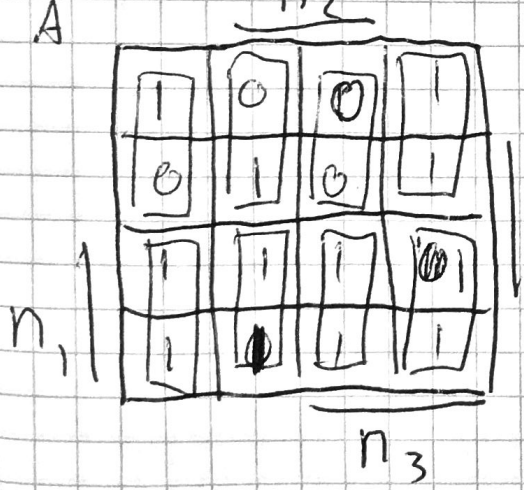
Continued Next Pg

CE100 Lab 3

hex7seg_mole

#	n_3	n_2	n_1	n_0	A	B	C	D	E	F	G
0	0	0	0	0	1	1	1	1	1	1	0
1	0	0	0	1	0	1	1	0	0	0	0
2	0	0	1	0	1	1	0	1	1	0	1
3	0	0	1	1	1	1	1	1	0	0	1
4	0	1	0	0	0	1	1	0	0	1	1
5	0	1	0	1	1	0	1	1	0	1	1
6	0	1	1	0	1	0	1	1	1	1	1
7	0	1	1	1	1	1	1	0	0	0	0
8	1	0	0	0	1	1	1	1	1	1	1
9	1	0	0	1	1	1	1	0	0	1	1
10	A	1	0	1	0	1	1	1	0	1	1
11	B	1	0	1	1	1	1	1	0	1	1
12	C	1	1	0	0	0	1	1	1	1	1
13	D	1	1	0	1	0	0	1	1	1	1
14	E	1	1	1	0	1	0	0	1	1	1
15	F	1	1	1	1	0	0	0	1	1	1

A

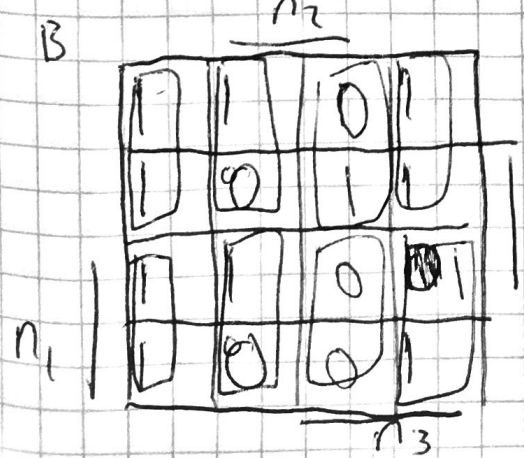


PIs

~n[0], 1, n[0], 1, 1, ~n[a],
~n[0], 1

0

B



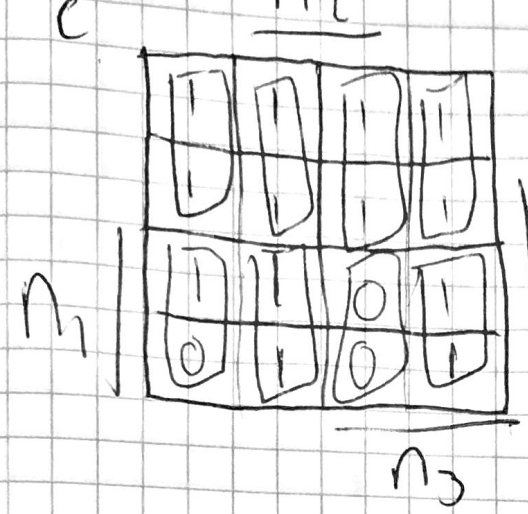
PIs

1, 1, ~n[0], n[0], 1, 1, n[0],

0

CE100 Lab 3

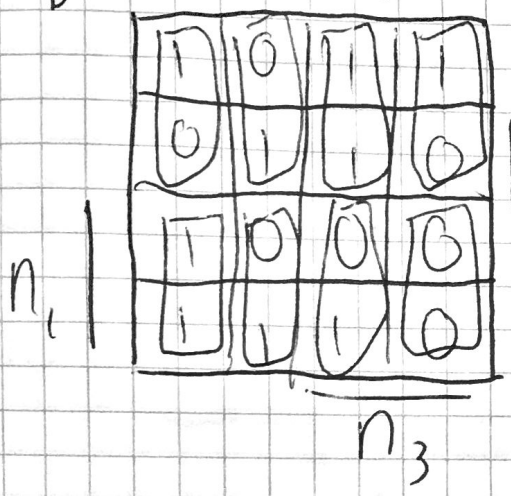
c



PIs

1, n[0], 1, 1, 1, 1, 1, 0

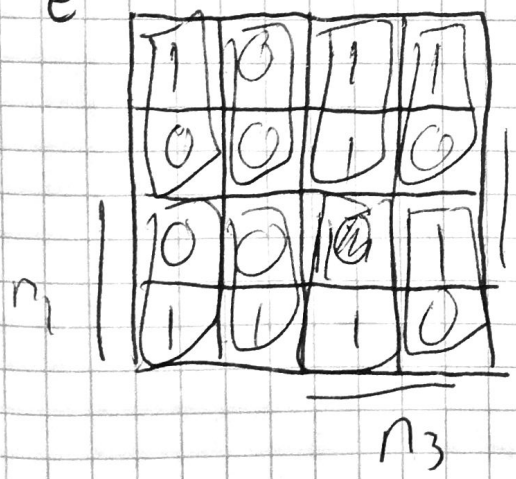
D



PIs

~n[0], 1, n[0], ~n[0], ~n[0],
0, 1, ~n[0]

e

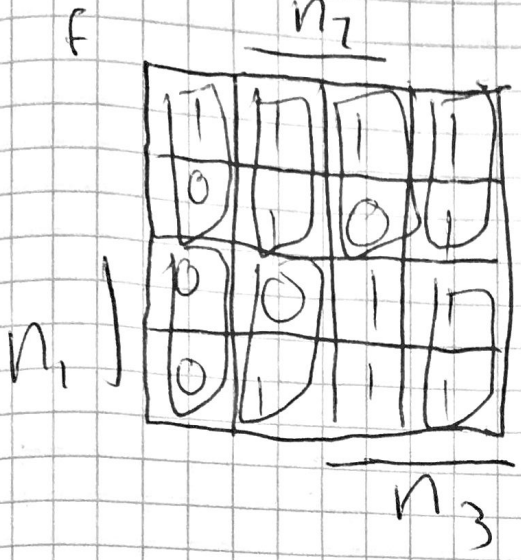


PIs

~n[0], ~n[0], 0, ~n[0], &
& ~n[0], n[0], 1, 1

CE100 Lab 3

f

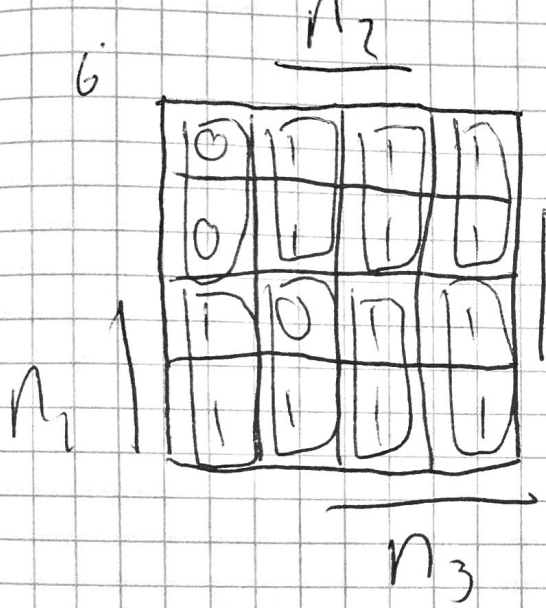


PIs

~n[0], 0, 1, ~n[0], 1, 1,

~n[0], 1

g



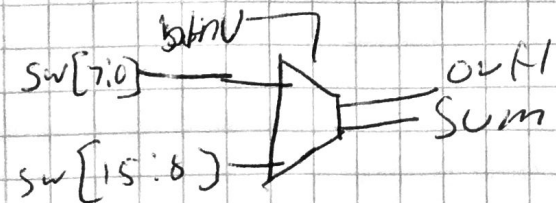
PIs

0, 1, 1, ~n[0], 1, 1, 1, 1

~~Top level Schematic~~

Lab3Top in: [15:0]sw, btnU, btnR, clk_in
out: seg[6:0], dp, an[3:0]

AddSub8



Lab3CE100

hex7seg01

in n_3 n_2 n_1 n_0

sum[3:2:1:0]/7654

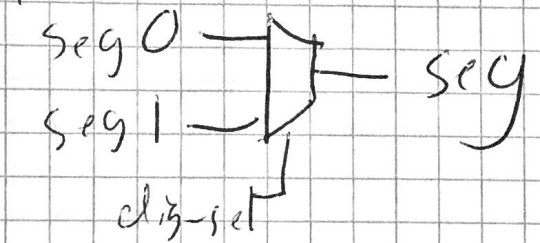
in c

dig_sel / dig_sel

out seg

seg0 / seg1

m2-1x8



Lab3sim

CE100 Lab 3

Top Level Design