Plan of Action

Steps

S' 1) Selector Variable For Arithmatic & Logic Circuits.

      i.e, choose arithmatic or logic ckt

      for output

S_0 2) Selector For AND or XOR

S_3 3) Selector For A_i or A_i' in

S_2 4) Selector For B_i' or c

      5) Equation for c [Intermediate Variable]

      6)   "   for C_{in} [Input carry determined

                              by control bits]

Get selector var expressions → 3 to 8 active
   low decoder

Use Quad 2 to 1 for multiplexing

Use 4 bit adder.

cs2	cs1	cs0	Functions	X_i	Y_i	C_{in}
0	0	0	$A-1$	A_i	1	0
0	0	1	$A-B-1/A+B'$	A_i	B_i'	0
0	1	0	$A-1$	A_i	1	0
0	1	1	$-A/A'+1$	A_i'	0	1
1	0	0	$A-B/A+B'+1$	A_i	B_i'	1
1	0	1	AB	$A_i B_i$	0	0
1	1	0	$A \oplus B$	$A \oplus B$	0	0
1	1	1	$A \oplus B$	$A \oplus B$	0	0

Arithmetic Unit

① ② ③ ④

{ operations (Decrement, Subtract with Borrow, Negation, Subtraction)

Inputs :-

$1,2,4$ 3

A_i & A_i'

$\underbrace{\qquad\qquad}_{S_3 \text{ (selection)}}$

Selection → S_3

$2,4$ $1,3$

B_i' &

$\underbrace{\qquad\qquad}_{S_2}$

Here, $C \to$ selection

(For 3) $0\,0\,0\,0$

$[\,1\,1\,1$ (For 1)

Basically use Quad 2 to 1 MUX to control input to adder.

Here, S_3, S_2 & $C \to$ Expressions of control variables.

The numbers imply operations.

K Maps

S_3

$Cs2 \backslash cs1, cs0$

A_i	A_i	A_i'	A_i
A_i	$\times$	$\times$	$\times$

$\rightarrow$

1	(	0	1
1	$\times$	$\times$	$\times$

A_i or A_i'

$\begin{array}{l} 1 \rightarrow A_i \\ 0 \rightarrow A_i' \end{array} \Big\} Mux \; [Can \; be \; different]$
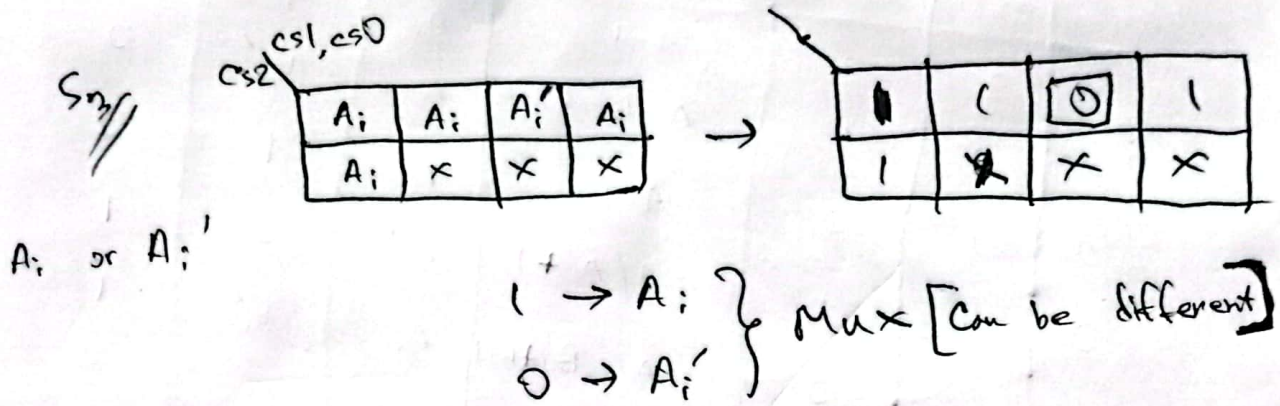
$S_3 = \overline{D_3} \quad (Active \; low \; decoder)$

We will use decoders to control input.

S_2

1	0	1	1
0	$\times$	$\times$	$\times$

$\begin{array}{l} 1 \rightarrow C \\ 0 \rightarrow B_i' \end{array}$

$S_2 = \overline{D_9} \, \overline{D_1}$

selects B_i' or C

C

1	$\times$	0	1
$\times$	$\times$	$\times$	$\times$

$C = \overline{D_3}$

Selects c variable value

$\begin{array}{l} 1 \rightarrow 1111 \, (c) \\ 0 \rightarrow 0000 \, (\text{L}) \end{array}$
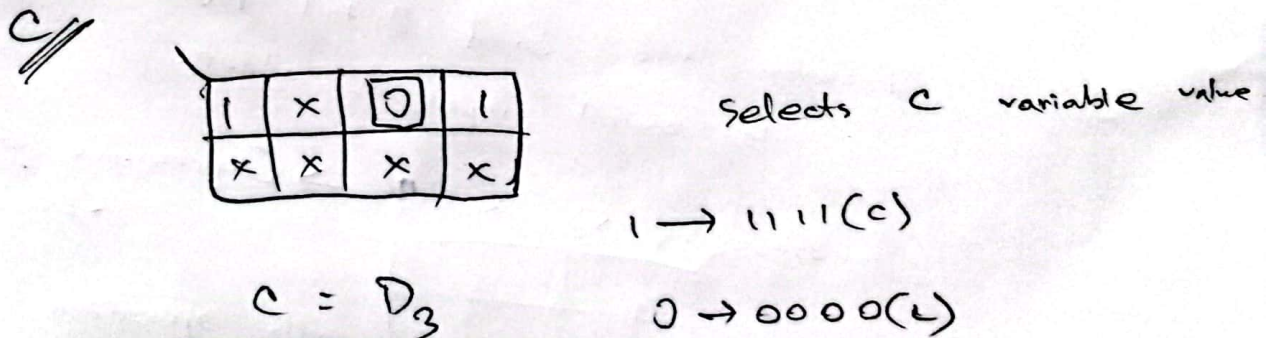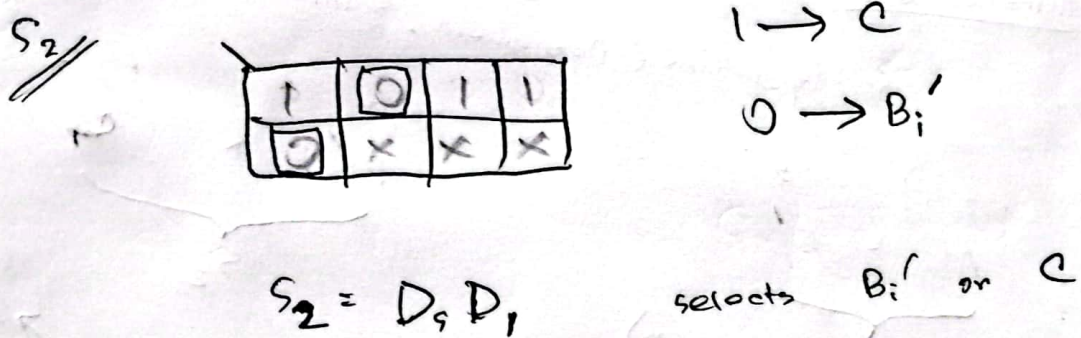
$S_0 //$ → Selector For XOR & AND.

x	x	x	x
x	0	1	1

0 → AND

1 → XOR

$$S_0 = D_5$$

$S' //$ → Selector For logical or arithmetic operation.

1	1	1	1
1	0	0	0

$$S' = D_7 D_6 D_5$$

1 → Arithmetic

0 → logical

~~S_0~~ ~~$S' = D_5 D$~~

$C_{in} //$

⓪	⓪	1	⓪
1	x	x	x

~~$C_{in} = \overline{D_1 D_3}$~~

$$C_{in} = \overline{D_4 \, D_3}$$

or $D_2 D_1 D_0$

} Need to check