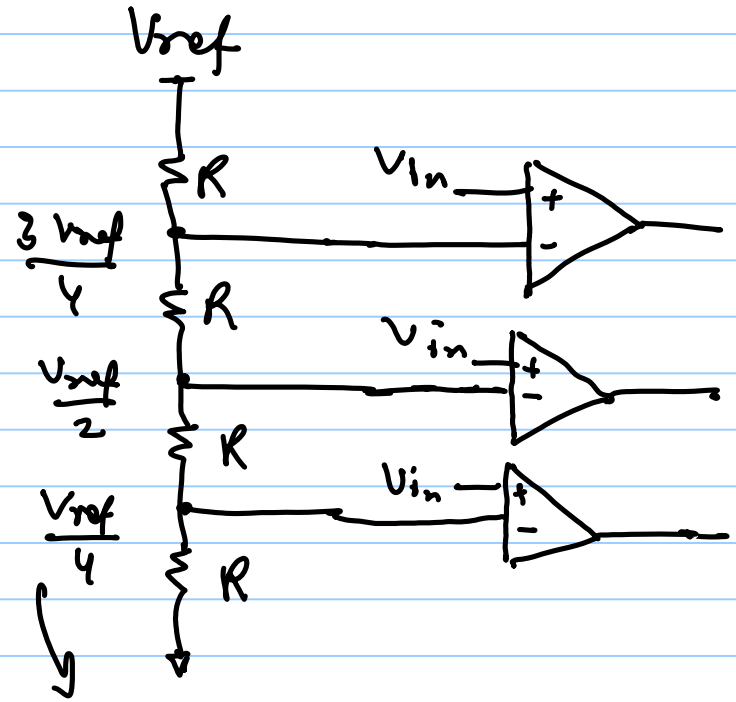
EE2019

Note Title 4/16/2019

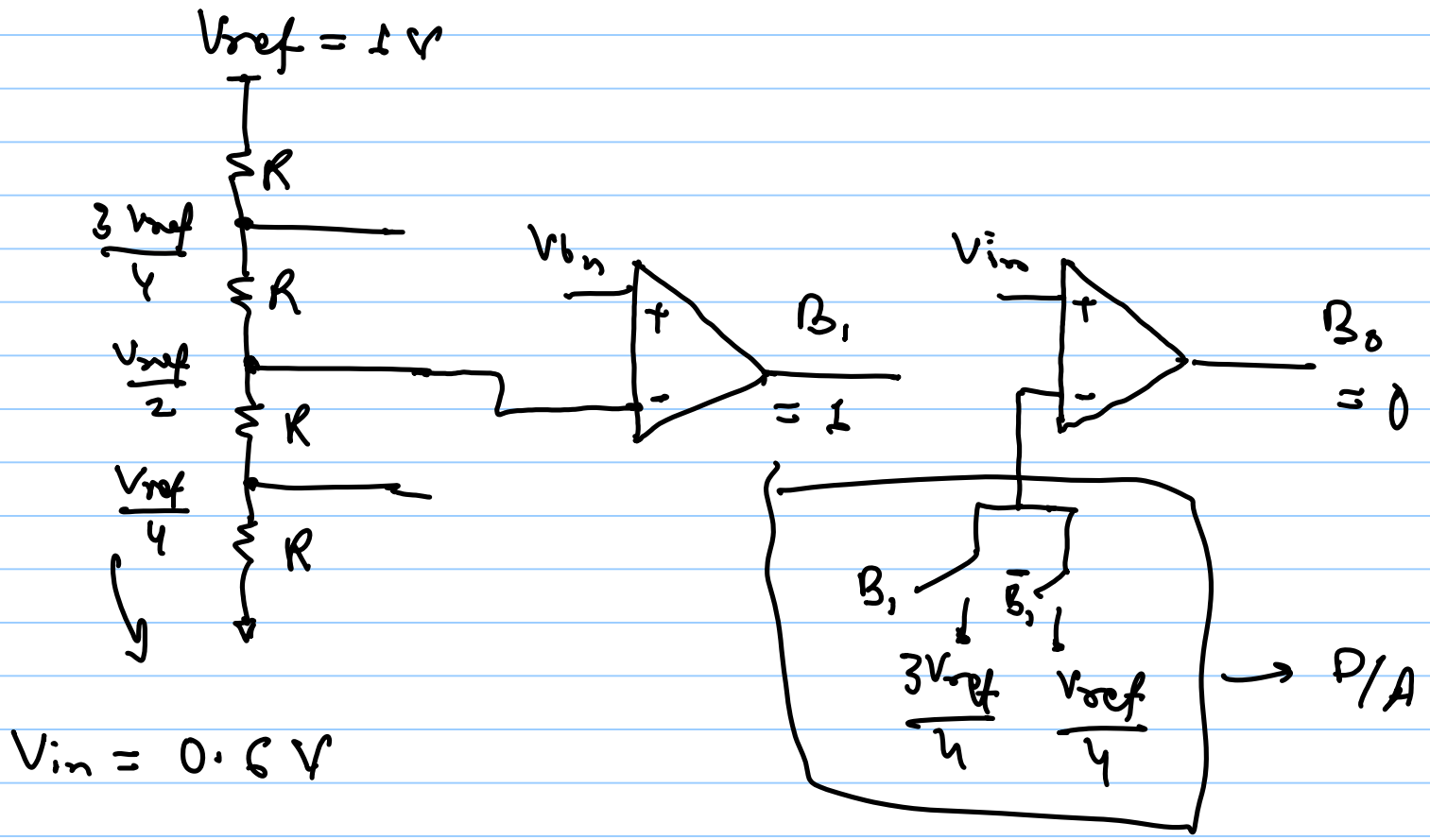


LSB ⇒ step size.

we require $2^N - 1$ comparators

$N \rightarrow$ no. of bits

Two step Flash A/D



Vin = 0.6 V

Binary to decimal.

N-bit $b_{N-1} \cdots b_0$

decimal code $= 2^{N-1} b_{N-1} + 2^{N-2} b_{N-2} + \cdots 2^1 b_1 + 2^0 b_0$

$b_1 \; b_0$

decimal code $= 2^1 b_1 + 2^0 b_0$

11

decimal code $= 2 \times 1 + 1 \times 1 = 3$

10

$= 2 \times 1 + 0 = 2$

⋮

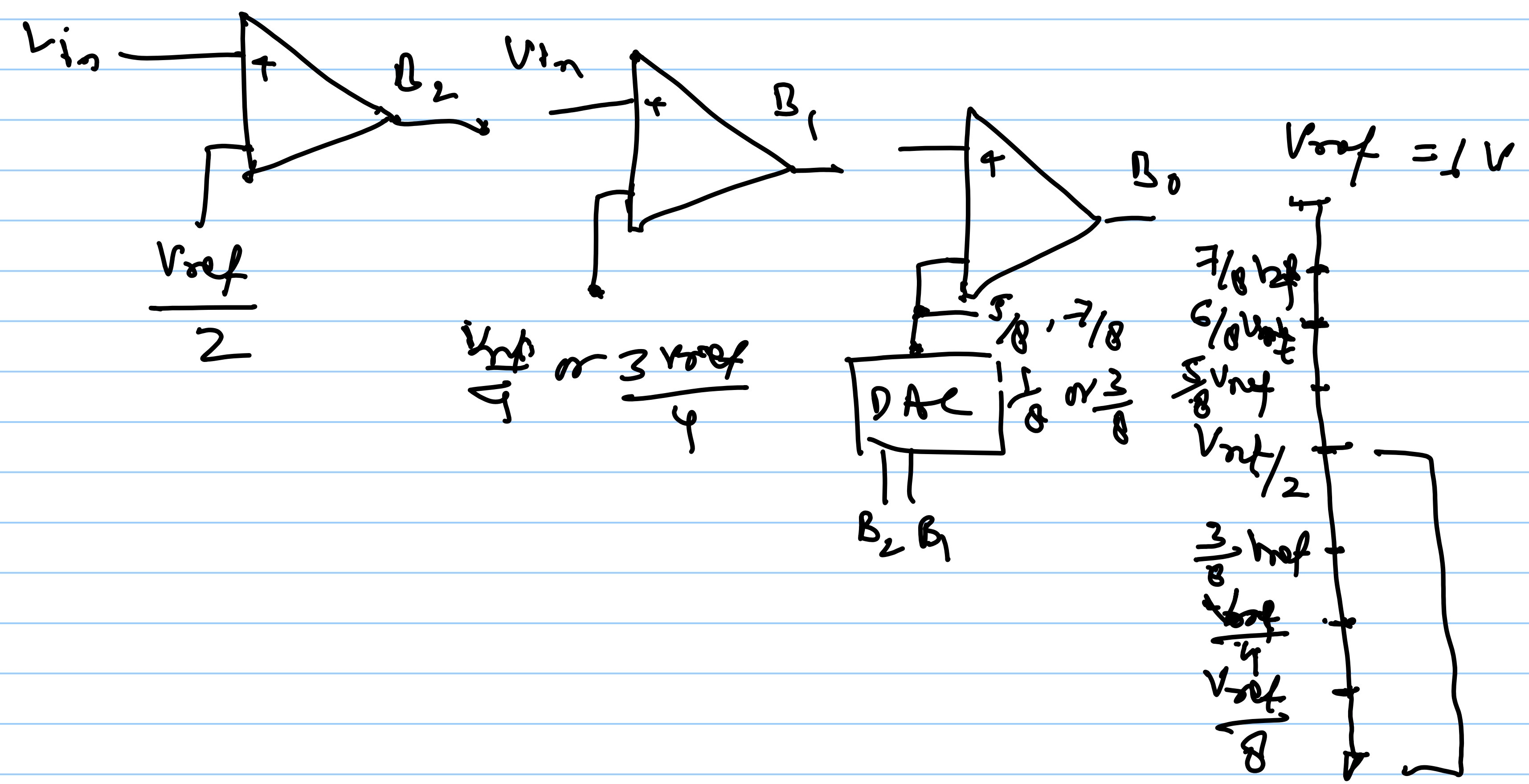
Analog o/p

= step size x decimal code

$= \frac{V_{ref}}{2^N} \times$ decimal code

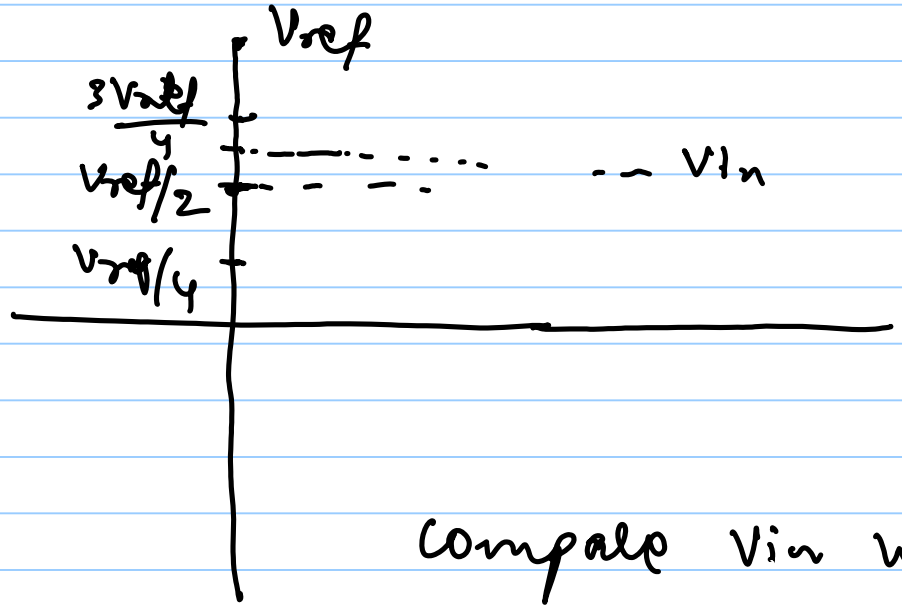
Analog o/p for

3-step Flash



V_{in}
+
B_2
$\frac{V_{ref}}{2}$
V_{in}
+
B_1
$\frac{V_{ref}}{4}$ or $\frac{3V_{ref}}{4}$
+
B_0
DAC
B_2 B_1
5/8, 7/8
$\frac{1}{8}$ or $\frac{3}{8}$
$V_{ref} = 1V$
7/8 V_{ref}
6/8 V_{ref}
$\frac{5}{8}V_{ref}$
$V_{ref}/2$
$\frac{3}{8}V_{ref}$
$\frac{V_{ref}}{4}$
$\frac{V_{ref}}{8}$

Binary search Algorithm



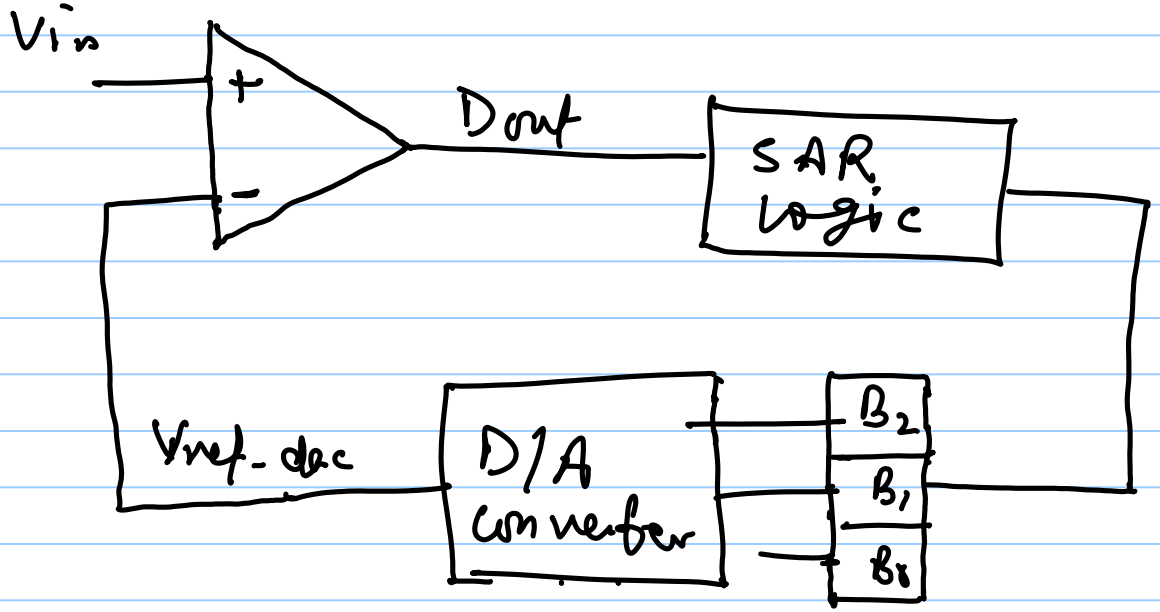
compare Vin with Vref/2

if Vin > Vref/2

compare Vin with $\frac{3}{4}$ Vref

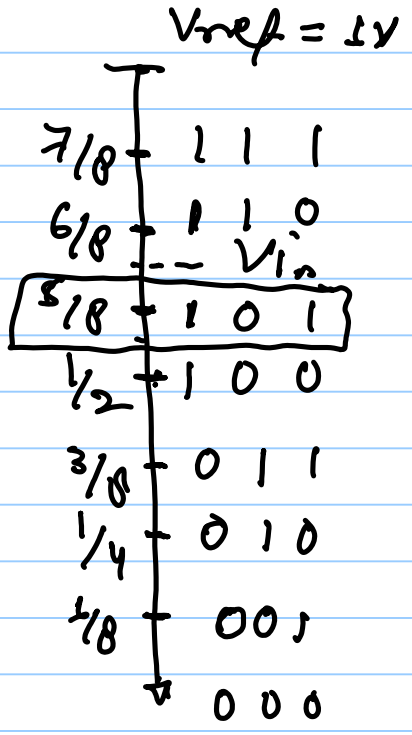
if Vin < Vref/2

compare Vin with $\frac{V_{ref}}{4}$



$V_{in} = 0.7\,V$

$V_{ref} = 1\,V$



start selecting width

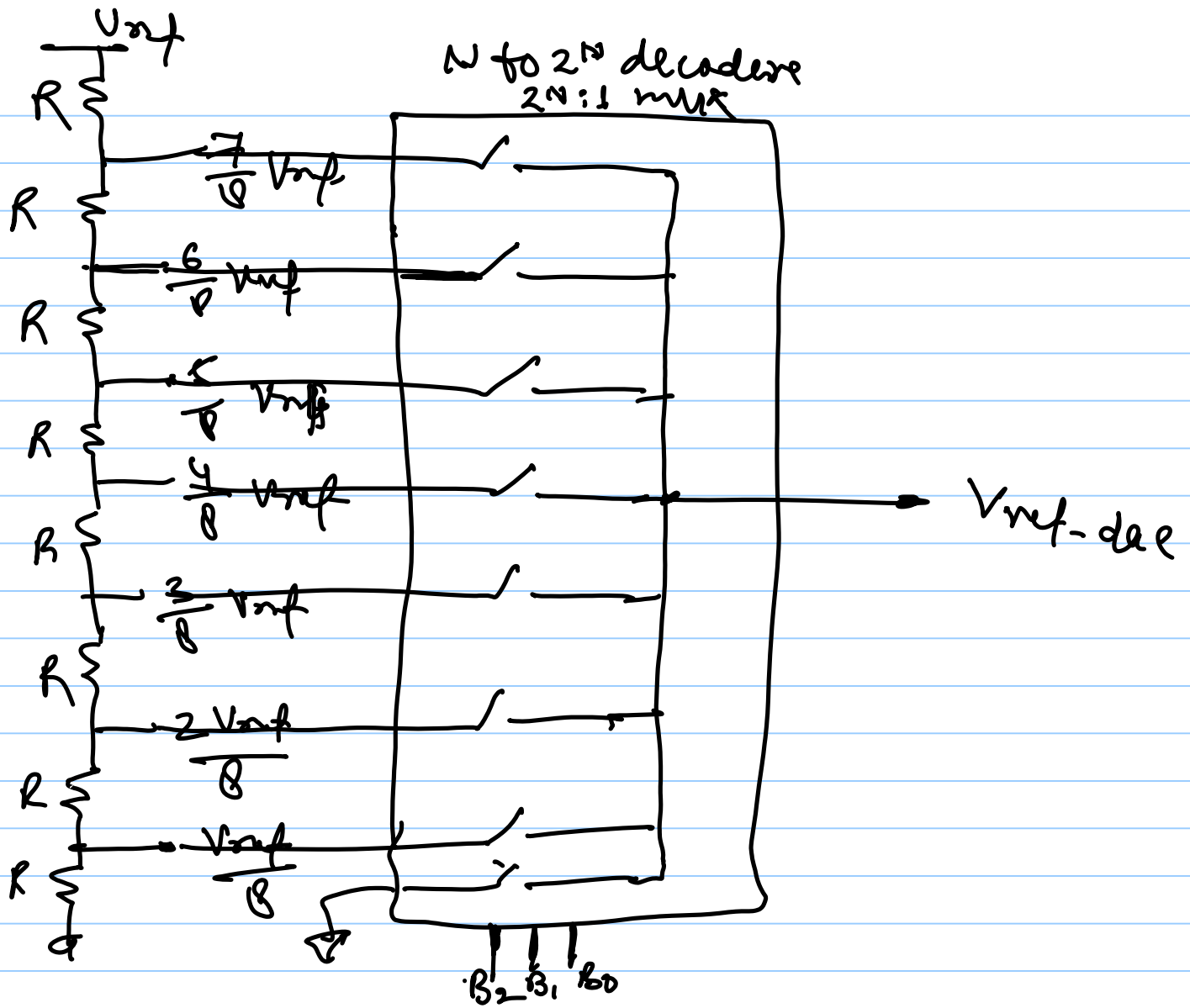
$V_{ref\_dac} = \frac{V_{ref}}{2} = \frac{1}{2}$

set $B_2 = 1, \quad B_1 = B_0 = 0$

Done = 1

retain the value of $B_2 = 1$ & move to next step

set


Vref
R
R
R
R
R
R
R
R
7/8 Vref
6/8 Vref
5/8 Vref
4/8 Vref
3/8 Vref
2 Vref / 8
Vref / 8
N to 2^N decoders
2^N:1 mux
Vref-dac
B2 B1 B0

$B_2 = 1$,

Set $B_1 = 1$

$V_{ref\_dac} = \frac{6}{8}$

Dout = 0

reset B_1 to 0 $\Rightarrow$ $\boxed{B_1 = 0}$

Set $B_0 = 1$

Dout = 1

$V_{ref\_dac} = \frac{5}{8}$

$\boxed{B_0 = 1}$

Binary code = 101