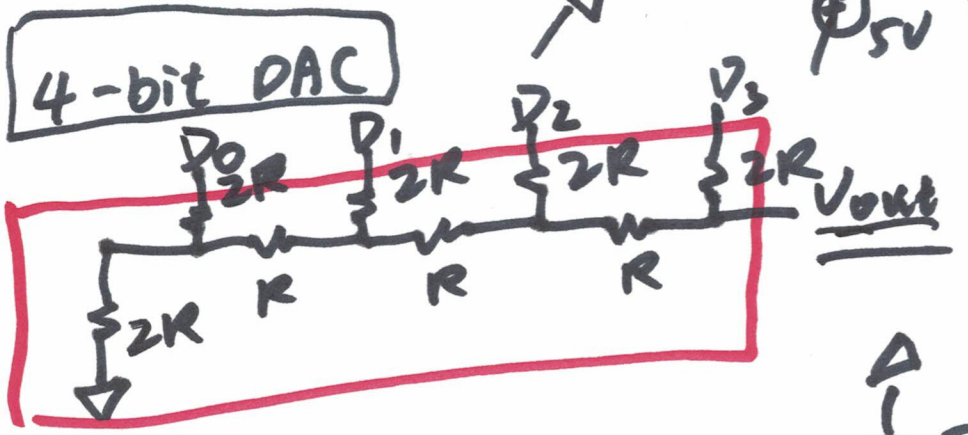
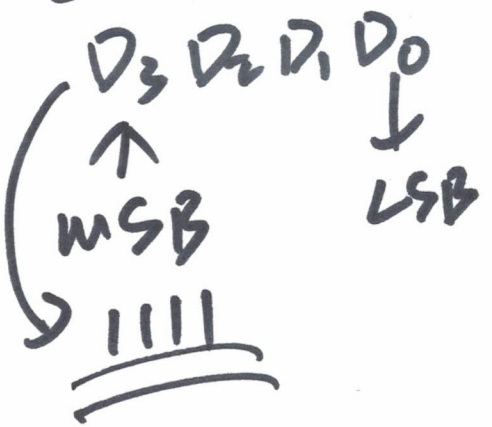
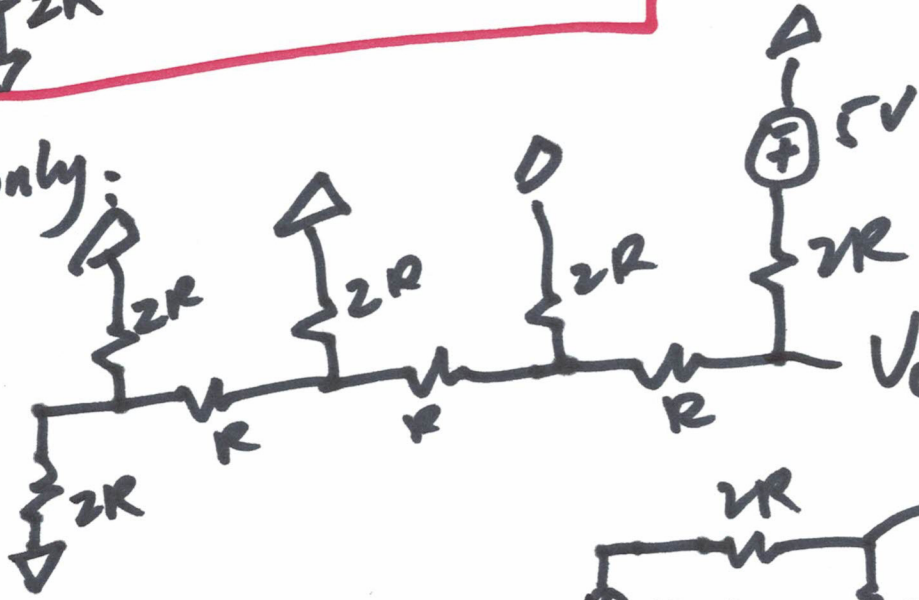
5V

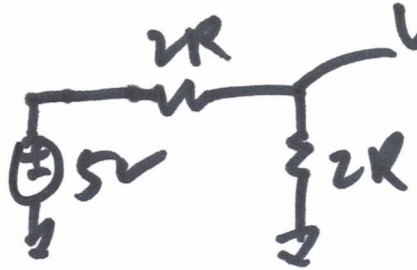
R-2R DAC



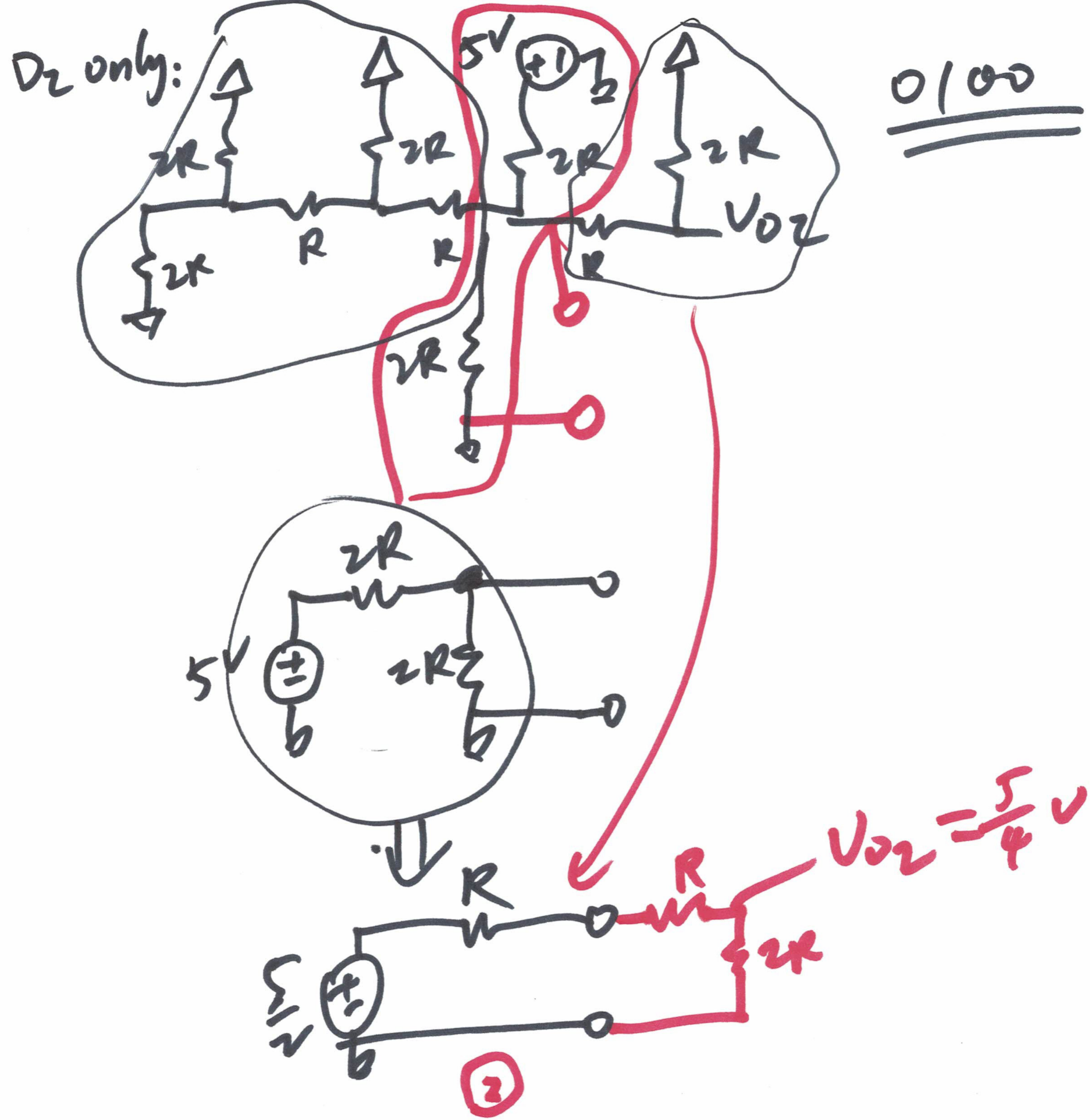


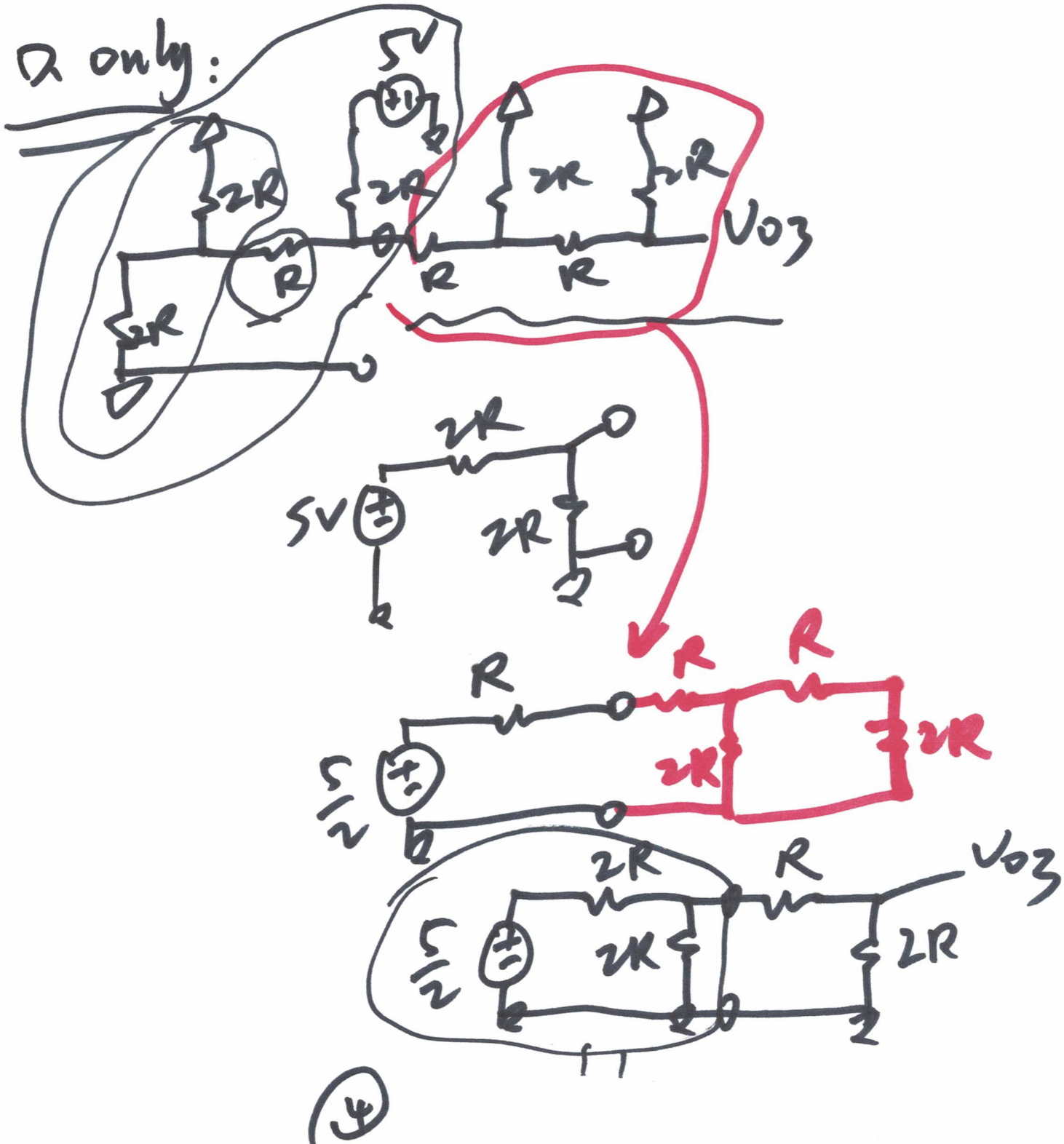
If D_3 only:

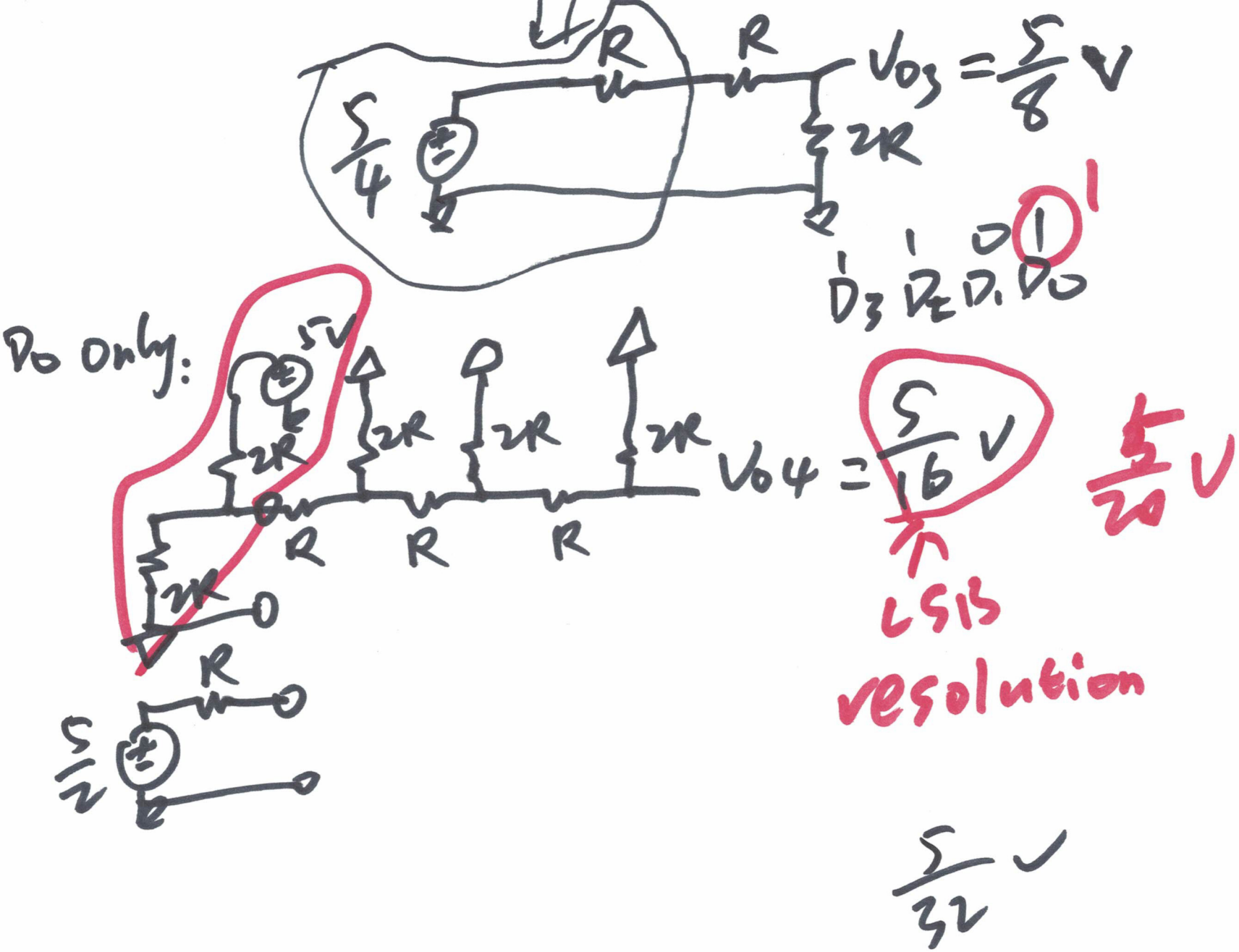




$V_{01} = \frac{5}{2} V = 2.5V$


D2 only:
0100
2R
2R
2R
2R
R
R
R
2R
5V
+1
2R
V02
2R
2R
5V
R
R
5/2 V
2R
V02 = 5/4 V
2

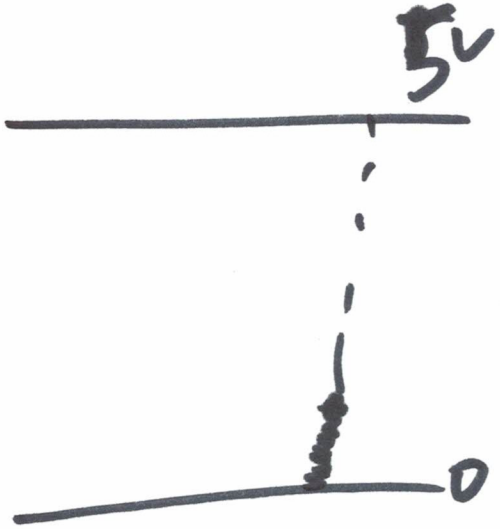

Q only:
5V
2R
2R
2R
R
2R
R
R
R
V_{O3}
2R
5V
2R
2R
R
R
R
2R
2R
$\frac{5}{2}$
2R
R
V_{O3}
$\frac{5}{2}$
2R
2R


R
R
5/4
2R
$V_{O3} = \frac{5}{8}$ V
D_3 D_2 D_1 D_0
1 0 1
D_0 Only:
5V
2R
2R
2R
2R
R R R
2R
R
5/2
$V_{O4} = \frac{5}{16}$ V
$\frac{5}{2^4}$ V
LSB
resolution
$\frac{5}{32}$ V

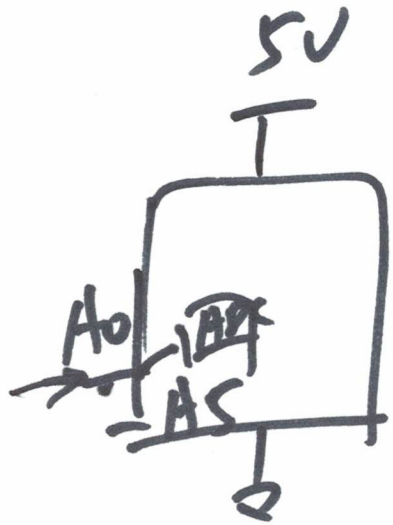
ADC → Analog to Digital Converter

LSB: Least Significant Bit

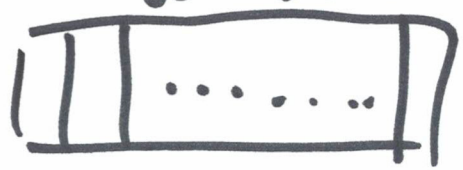
MSB: Most



10-bit



$\frac{5V}{2^{10}} = 4.8mV$



1mV

$2^{10} = 1024$

$\frac{5V}{2048} = 2.5mV$

13-bit

(b)

0-5V reference

1mV change sensitivity required.

resolution of ADC to be used?

$$\frac{5}{2^x} \quad \frac{5V}{1mV} = \frac{2^{(x)}}{1}$$

$$x = 1053$$

$$x = \log_2 \frac{5V}{1mV}$$

$$= \log_2 5000 = 12.288$$

$$\approx 13$$

(3)

DAC full-scale value V_{FS}

DAC input: 1111 +1 = 10000

$$V_{out}? = \frac{5}{16} + \frac{5}{8} + \frac{5}{4} + \frac{5}{2}$$

$$= \frac{5}{16} + \frac{10}{16} + \frac{20}{16} + \frac{40}{16}$$

$$= \frac{75}{16} = \square \quad \frac{80}{16} = 5V$$