[CSE350-S04]

Inspiring Excellence

ASSIGNMENT - 01

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Answer to the question - 01

Following, ⓐ

$$V_{out} = -V_R\left(\frac{S_3}{1} + \frac{S_2}{2} + \frac{S_1}{4} + \frac{S_0}{8}\right)$$

$V_R = -8V$
$R_3 = Rf = R$

S_3	S_2	S_1	S_0	Decimal value	V_0 in volts
0	0	0	0	0	0
0	0	0	1	1	1
0	0	1	0	2	2
0	0	1	1	3	3
0	1	0	0	4	4
0	1	0	1	5	5
0	1	1	0	6	6
0	1	1	1	7	7
1	0	0	0	8	8
1	0	0	1	9	9
1	0	1	0	10	10
1	0	1	1	11	11
1	1	0	0	12	12
1	1	0	1	13	13
1	1	1	0	14	14
1	1	1	1	15	15

1(b)

Maximum voltage from 1(a) = 15 V
[1111]

LSB voltage from 1(a) = 1V
[0001]

Ratio of maximum output voltage and LSB voltage = 15 : 1
(Ans)

1(c)

$$v_0 = -\frac{V_R}{R_3} \cdot R_f \left(S_3 + \frac{S_2}{2} + \frac{S_1}{4} + \frac{S_0}{8} \right)$$

$$\Rightarrow 5 = -\frac{(-8V)}{R_3} \cdot R_f \left(1 + 0 + \frac{1}{4} + 0 \right)$$

$$\Rightarrow 5 = \frac{R_f}{R_3} \times 10$$

$$\Rightarrow \frac{5}{10} = \frac{R_f}{R_3}$$

$$\Rightarrow \frac{1}{2} = \frac{R_f}{R_3}$$

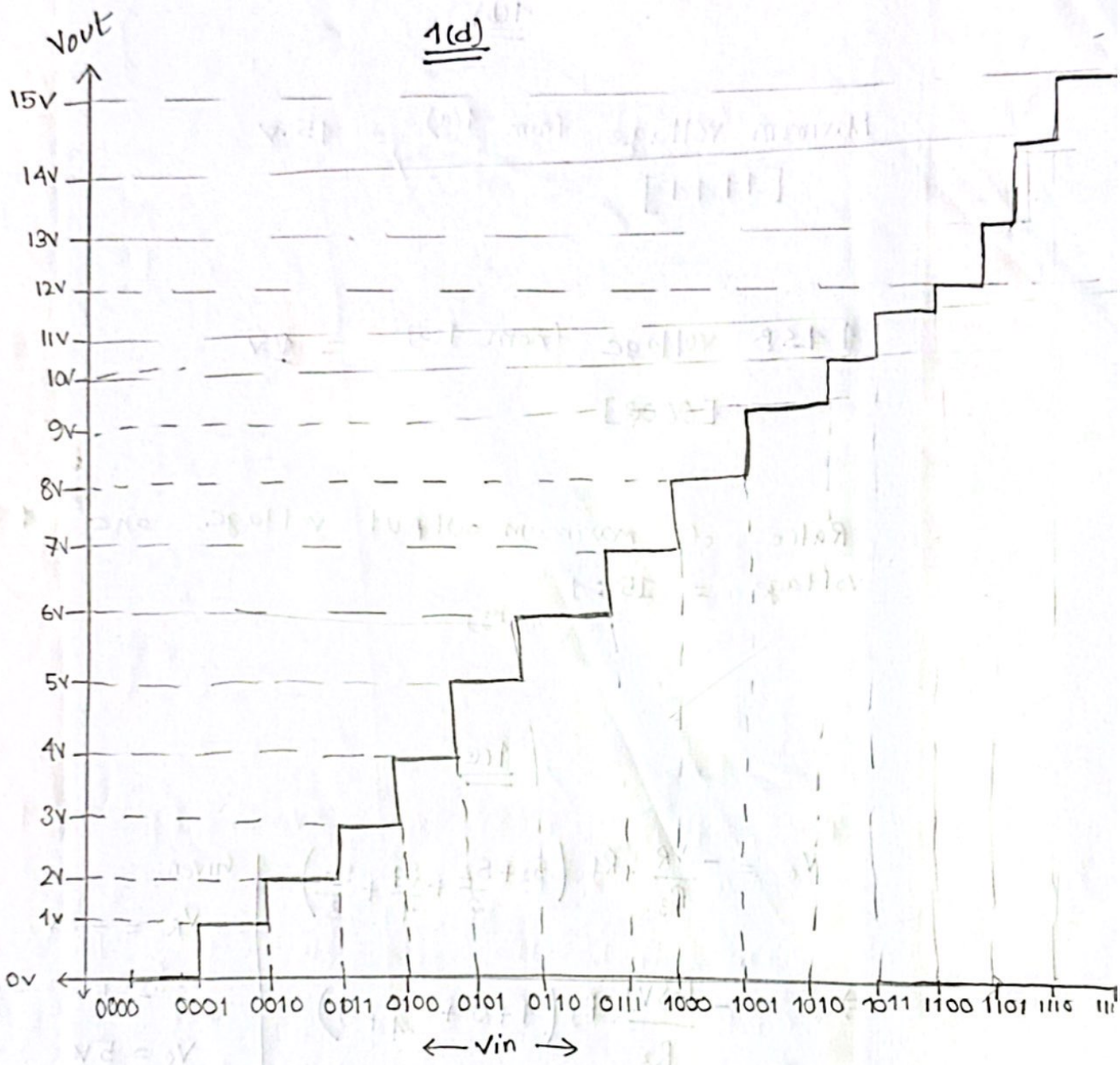
$$\Rightarrow R_3 = 2R_f$$

$$\Rightarrow R_3 / R_f = 2/1$$

$$R_3 : R_f = 2 : 1$$

Given,
$V_R = -8V$
$S_3 S_2 S_1 S_0 = 1010$
$V_0 = 5V$
$R_3 = R_f = R$

1(d)



From (a) Vout vs Vin graph

1(e)

Resolution is the smallest voltage change that can be produced by DAC which is also known as 1LSB. So, in order to improve it, we do the following things,

1. By increasing no of bits, it will increase resolution
2. We can also follow R-2R Ladder DAC to implement with fewer resistor