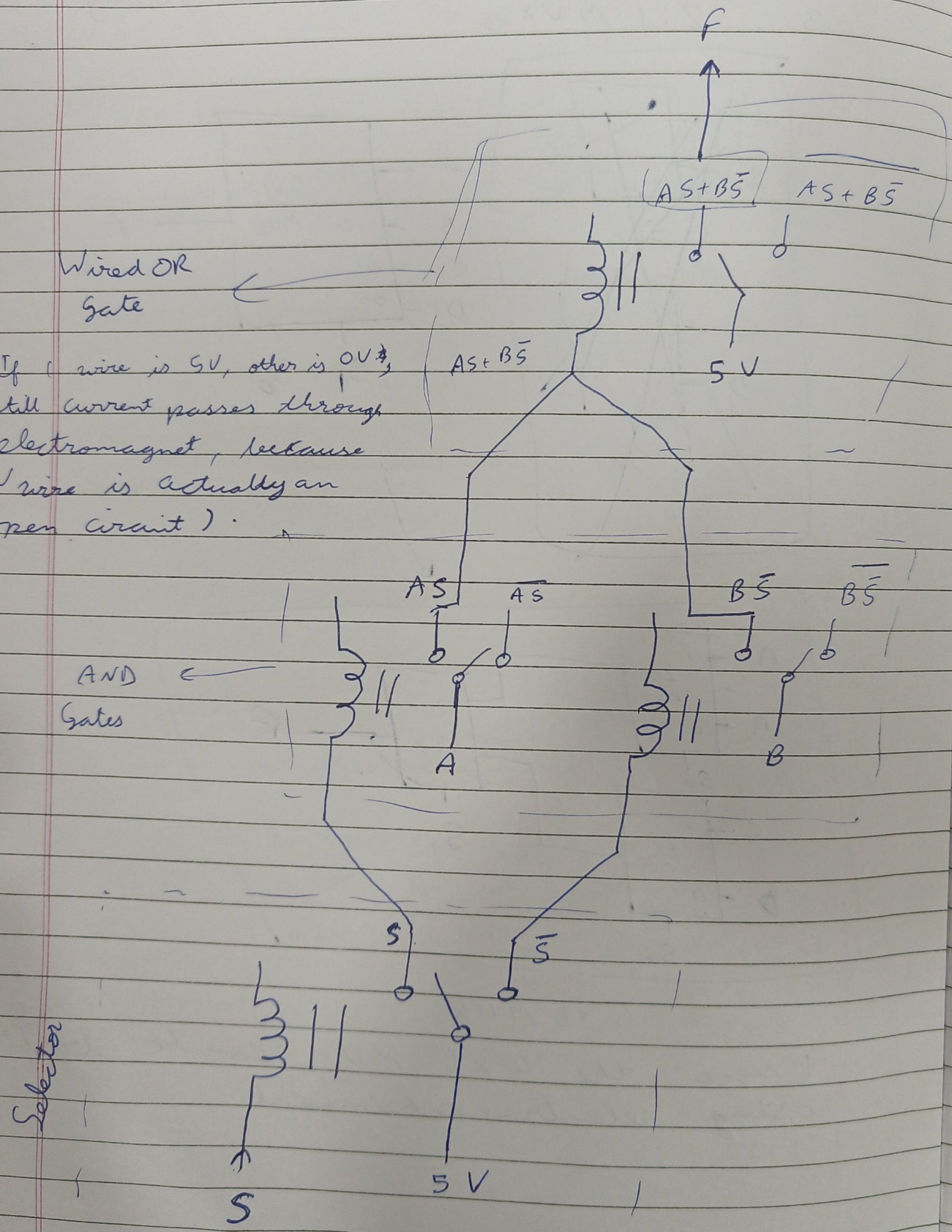
2 : 1 MUX

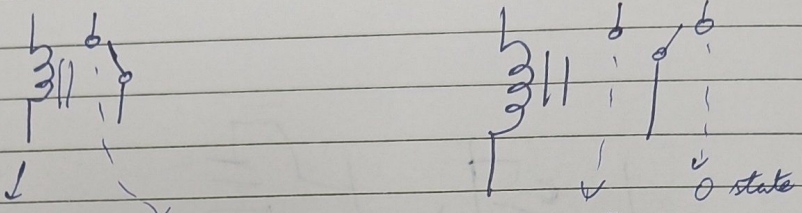


(If 1 wire is 5V, other is 0V, still current passes through electromagnet, because 0V wire is actually an open circuit).

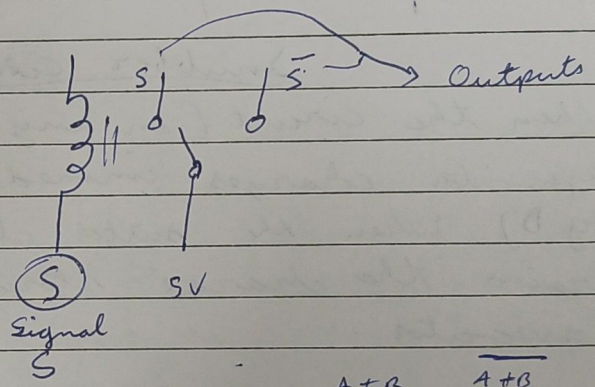
(Q2)

PART - A

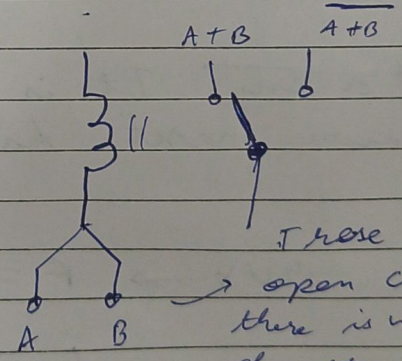
Electromechanical Switch's schematic diagram



~~To protect a~~



Wired OR Gate :-



These circuits are open circuits, so there is no back-flow of voltage at low states

Electromagnet pulls the armature towards the pin in the left when it is ON.
∴ If signal S is passed through EM, the left pin gives S as output and right pin gives $\bar{S}$ as output.

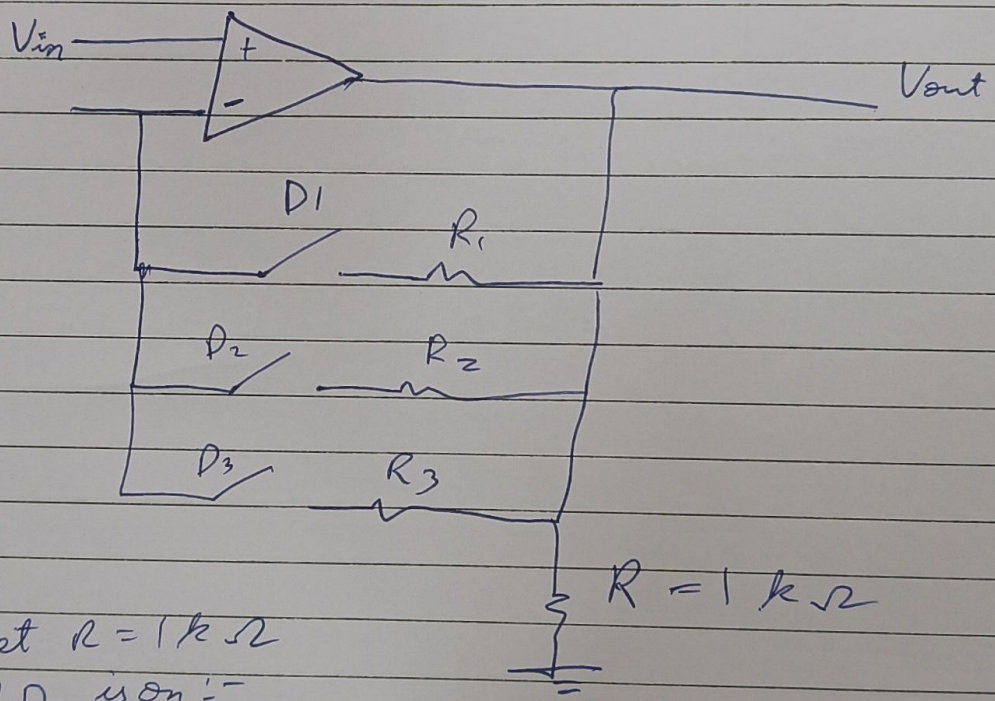
$D_1 = \bar{A}$ (1 if $V_{in} < 100$)

$D_2 = A\bar{B}$ (1 if $V_{in} > 100$ and $V_{in} < 200$)

$D_3 = B$ (1 if $V_{in} > 200$)

Part B

Designing the programmable gain amplifier



Let $R = 1k\Omega$

If D_1 is on :-

$$V_{out} = \left(\frac{V_{in}}{R_1} + \frac{0}{R_a}\right)\left(\frac{R_1 R_a}{R_1 + R_a}\right)$$

$$= V_{in} \times \frac{1}{R_1 + 1}$$

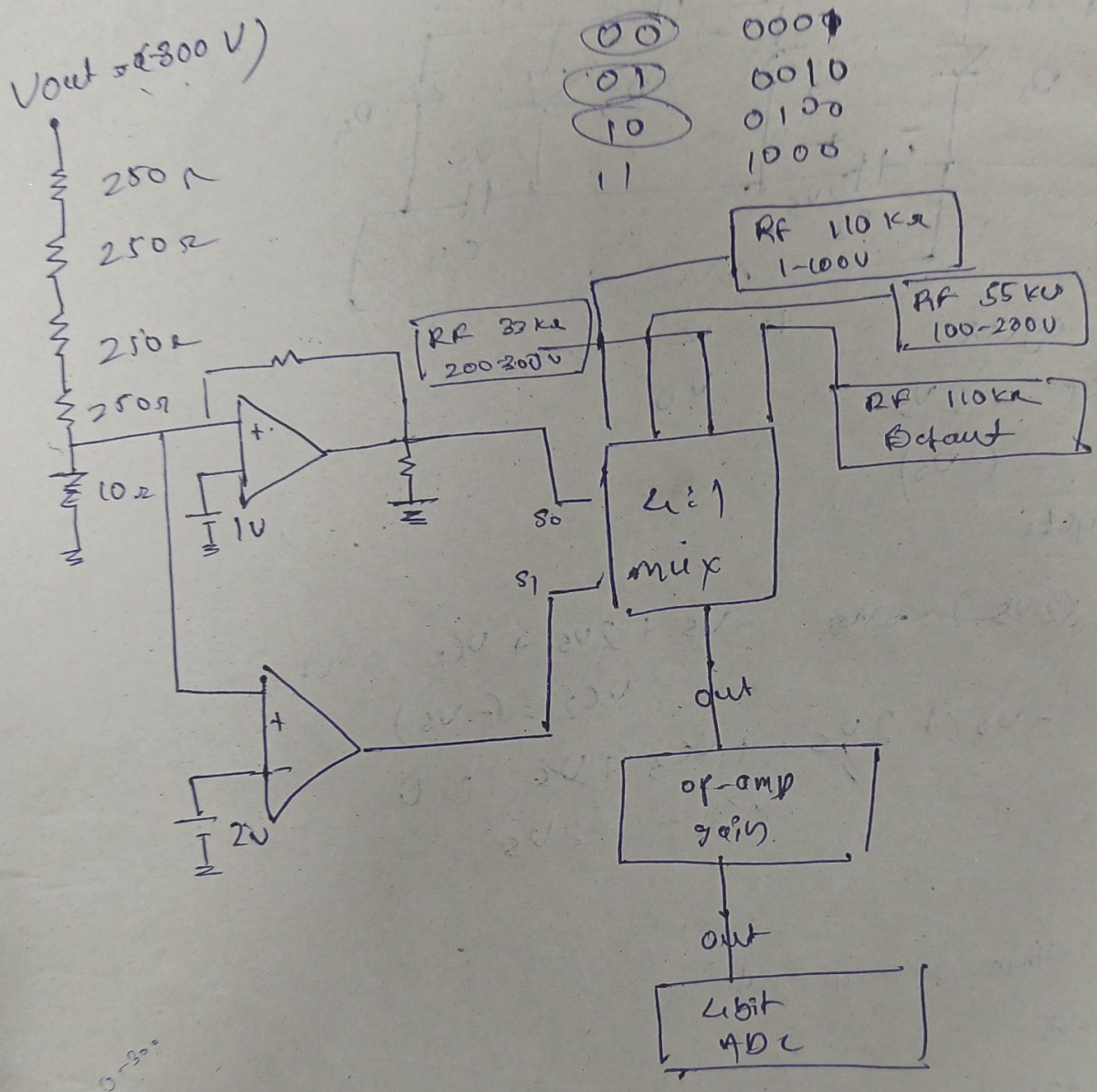
V_{out} must be 3.3 V

$$\therefore R_1 = \frac{V_{in}}{3.3} - 1$$

$$= \frac{100}{3.3} - 1 = 29.303\,k\Omega$$

D_1 is on if $V_{in} < 100$ $\therefore$ $V_{out} = 3.3V$ if $V_{in} = 100V$

2.4



00	0001
01	0010
10	0100
11	1000