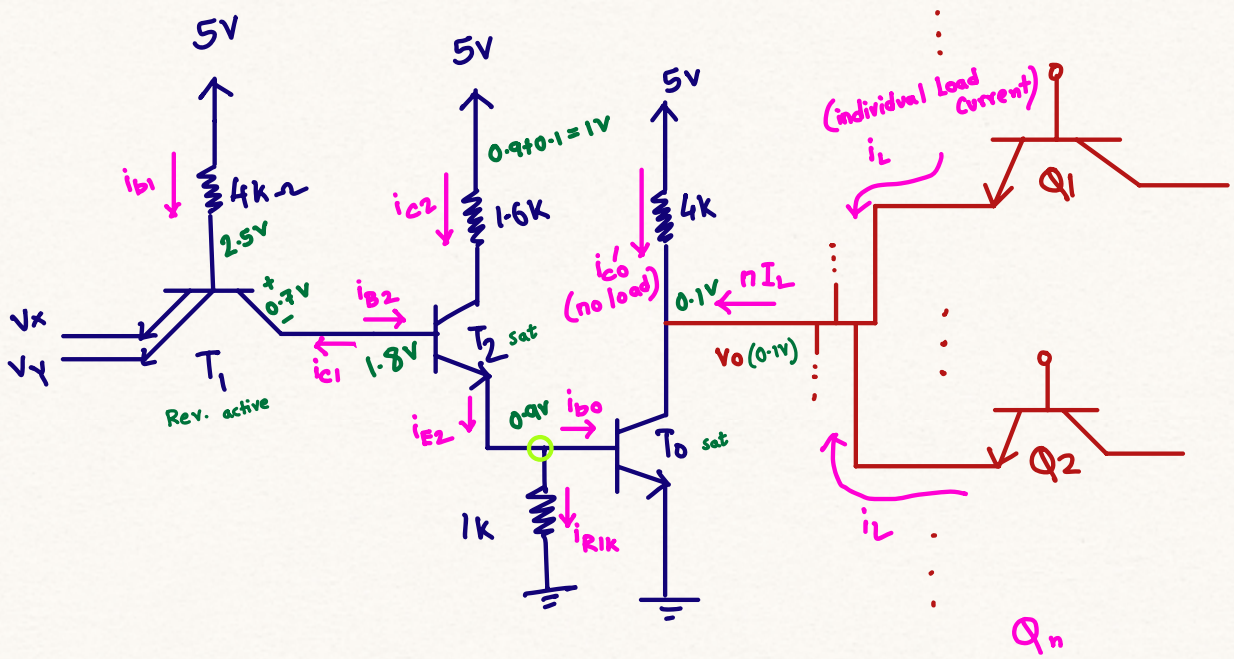
Q. Find maximum fanout for this ckt.

Case ① : output of driver low ($V_o = 0.1$)

Given: $V_{CE(sat)} = 0.1\,V$ $\quad \beta_R = 0.1$

$\beta_{FWD} = 25$ $\quad V_{OH} = 3.4\,V$

Case I : output low



main eqn. : $I_{CO_{max}} = I_{co}' + n_{max} I_L$ —— ①

② $I_{CO_{max}} = \beta_{FWD} \cdot I_{bo}$; @ sat

③ $I_{bo} = I_{E2} - I_{R1K}$

④ $I_{R1K} = \dfrac{0.9 - 0}{1K}$

⑤ $I_{E_2} = I_{B_2} + I_{c_2}$

⑥ $I_{c2} = \dfrac{5 - 1}{1.6K}$

$I_{b1} = \dfrac{5 - 2.5}{4k}$ ⑦

$I_{C1} = \beta_{REV} \cdot I$ ⑧

$|I_{B2}| = |I_{C1}|$ ⑨

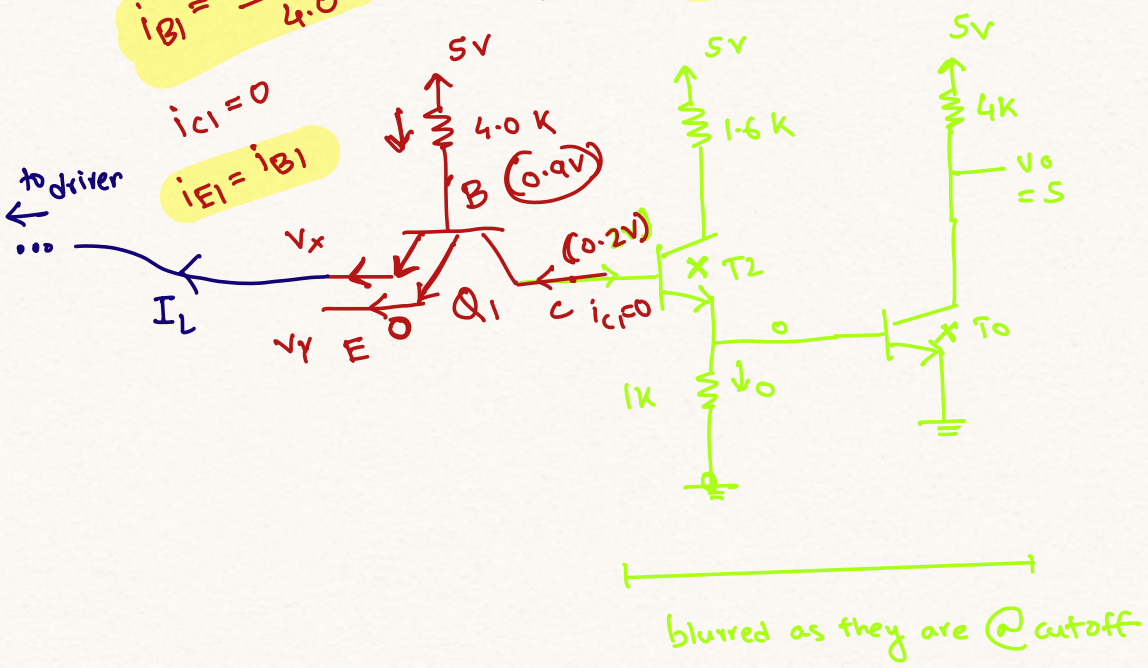
Load condition in this case ...

Q_1 load is at saturation

$i_{B1} = \frac{5 - 0.9}{4.0\,K}$

$i_{EY} = 0$

$\therefore i_{EX} = i_E = I_L$



T_0, T_2 sat ; T_1 R.A. (driver ckts)

Q_1 ⟶ saturation (Load) as output Low

i_C' = no load current = $\frac{5-0.1}{4k}$

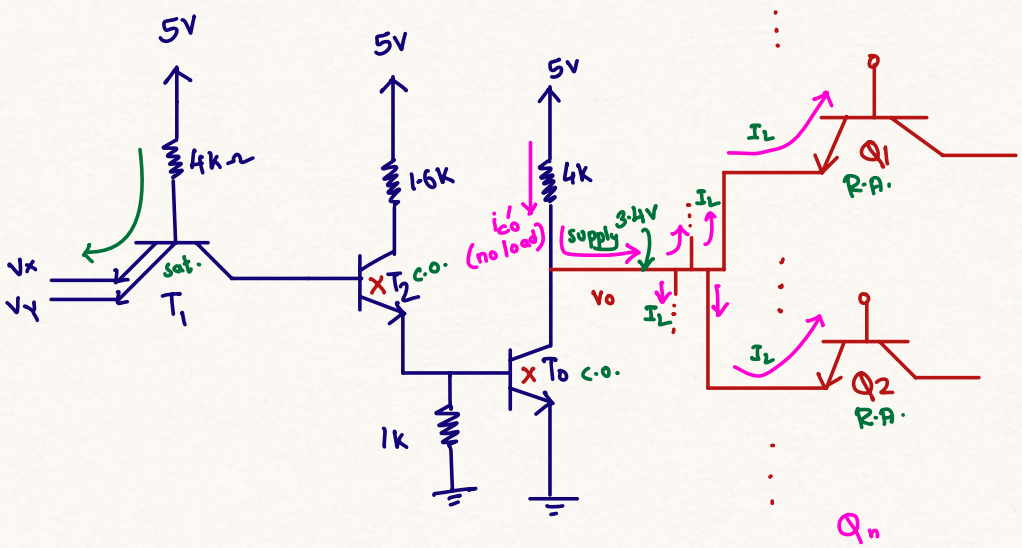
i_L = individual load current = $\frac{5-0.9}{4k}$ See load diagram

i_{B0} = base current of T_0 = 2.5725 mA

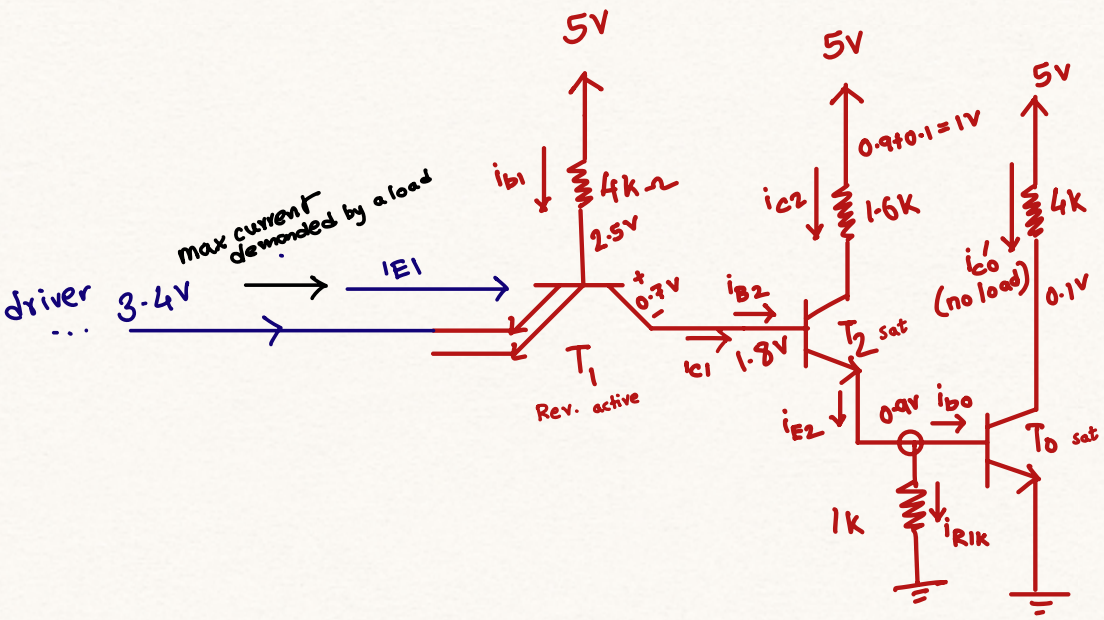
$i_{C,max} = \beta_{FWD} \times i_{B0} = i_L \times n_{max} + i_C'$

$max = \lfloor 61.35 \rfloor = 61$

Case 02 : The output of driver is high



Load condition for this case



For Load

$$I_{E1} = \beta_{Rev} \cdot I_{B1}$$

$$I_{B1} = \frac{5 - 2.5}{4k}$$

max current demanded by a load = I_{E1}

For driver

$$\text{max supply current} = \frac{5 - 3.4}{4k}$$

$$\text{Max Fanout} = \frac{\text{supply}}{\text{demand}} = \frac{0.4}{0.0675} = \lfloor 5.92 \rfloor = 5$$

Finally max fanout = $\min(5, 61) = 5$ //