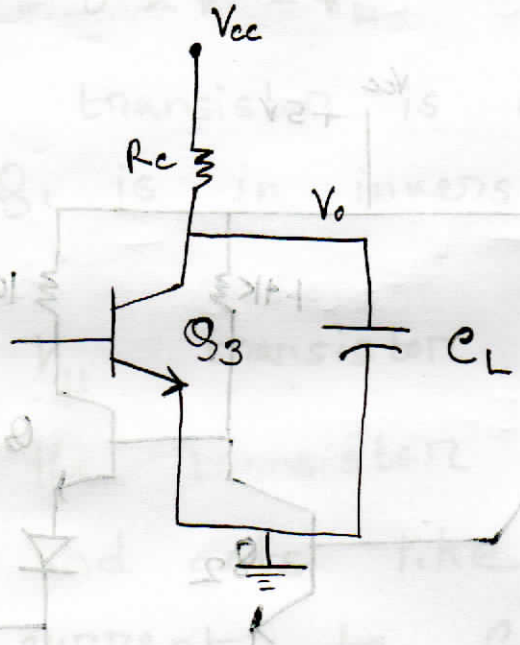
Passive pull-up ckt

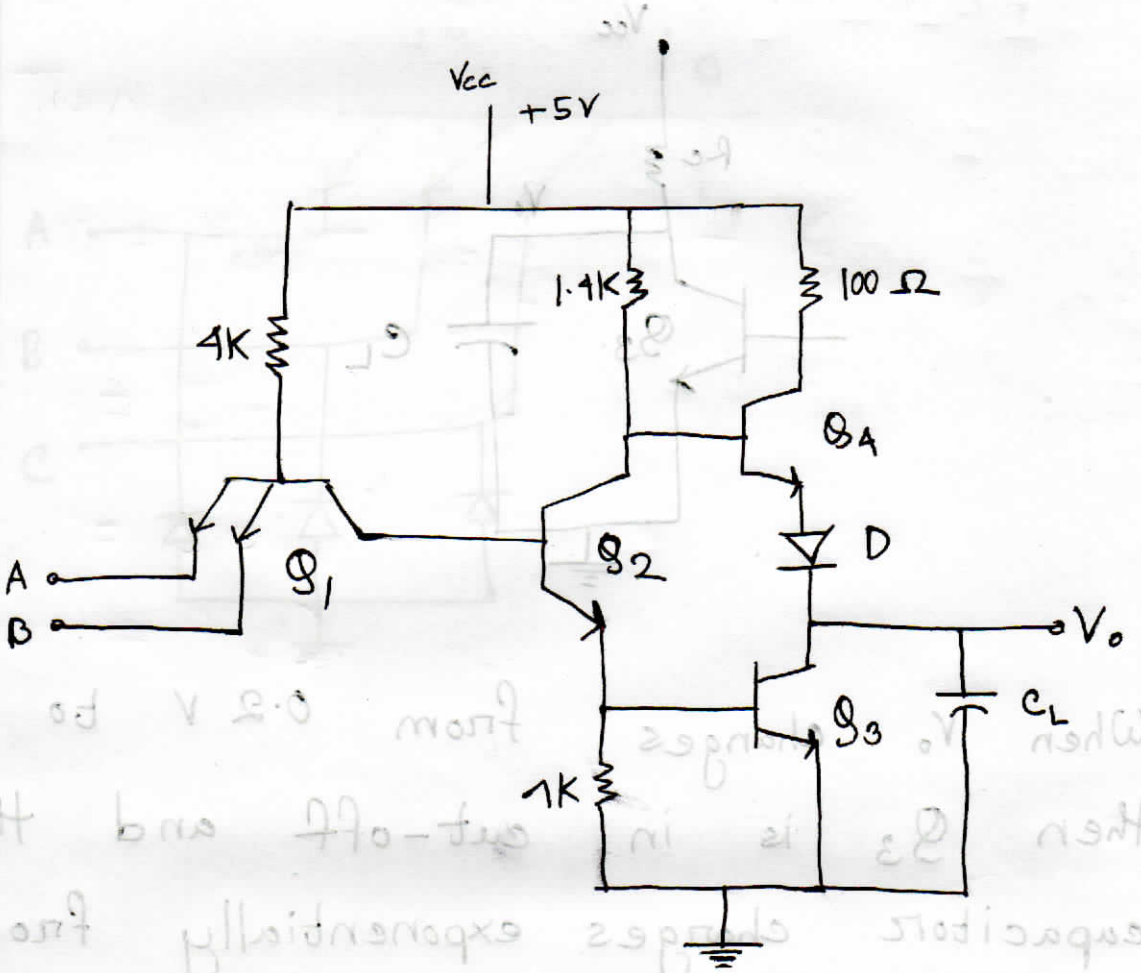


When V_o changes from 0.2 V to V_{cc} then Q_3 is in cut-off and the capacitor charges exponentially from $V_{CE(sat)}$ to V_{cc}

$$I = \frac{V_{cc} - V_{CE(sat)}}{R_c}$$

Time constant $= R_c C_L$ $[C_L$ = fixed$]$

Wired End :



V_{O_H} — In this ckt, transistor Q_4 acts like an active pull-up ckt replacing the passive pull up resistor R_c. This ~~out~~ output configuration is called "totem-pole"

amplifier because Q_4 sits up on Q_3

When $V_o = 0.2\,V = V_L$

The Q_3 transistor is in saturation and Q_1 is in inverse active mode

When $V_o = V_H$ transistor Q_3 is in cut off, the transistor Q_4 is in saturation and acts like source supplying current to C_L.

The diode is used because the value of i will decrease and dissipation will decrease.

Here, Q_4 and diode combinedly form the active pull up ckt.

When, V_o increases the current in Q_4 decreases, and Q_4 comes out of saturation and finally V_o

reaches a steady state when Q_4 is at the cutin condition.

Then,

$$V_o = V_{cc} - V_{BE_4(cutin)} - V_{D.(cutin)}$$

$$= 5 - 0.5 - 0.6$$

$$= 3.9V$$

$$= V(1)$$