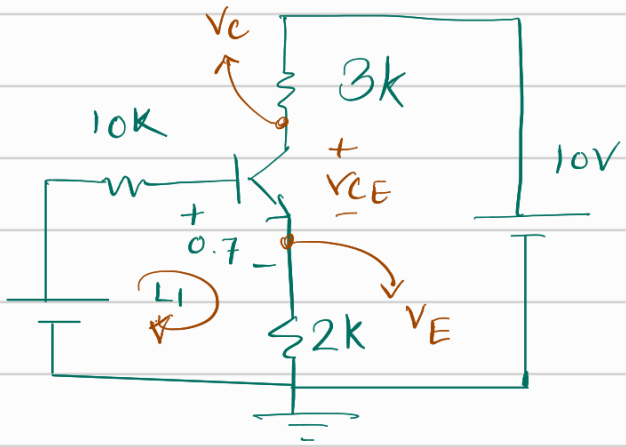
* BJT Math (cont^n)

$\beta = 100$

I_C, I_B, I_E, V_{CE}



Assume, Active

$I_C = \beta I_B$

L1: $5 = 10 I_B + 0.7 + 2 I_E$

$\Rightarrow 5 = 10 I_B + 0.7 + 2(I_B + \beta I_B)$

$\Rightarrow 5 = 10 I_B + 0.7 + 2(1+\beta) I_B$

$\Rightarrow I_B = 0.02\ mA.$

$I_C = 2\ mA$

$I_E = 2.02\ mA$

$V_C = 10 - 3 I_C$

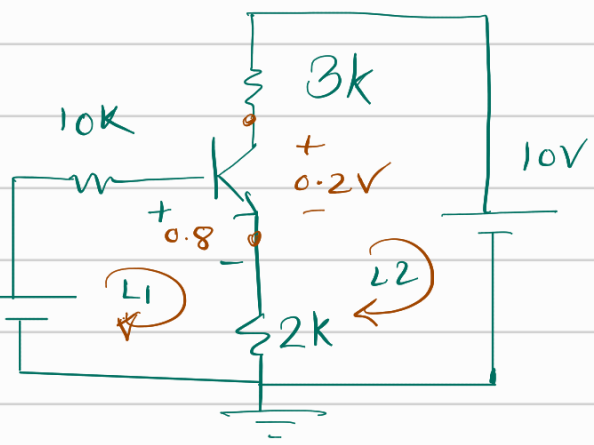
$V_E = 2 I_E$

$\therefore V_{CE} = V_C - V_E = -0.04\ V < 0.2\ V$

For active, $V_{CE} > 0.2V$ ⟶ Assumption wrong.

Assume, Saturation

$V_{CE} = 0.2V,\ V_{BE} = 0.8\ V$



L1: $5 = 10 I_B + 0.8 + 2 I_E$

$\Rightarrow 10 I_B + 2 I_E = 4.2$ ✓

$\Rightarrow 12 I_B + 2 I_C = 4.2$ ... (I)

$I_C + I_B = I_E$ ✓

L2: $10 = 3 I_C + 0.2 + 2 I_E$

$\Rightarrow 3 I_C + 2 I_E = 9.8$ ✓

$\Rightarrow 2 I_B + 5 I_C = 9.8$ ... (II)

Solving (I) & (II) ⇒

$I_B = 0.025\ mA$

$I_C = 1.95\ mA$

$I_E = 1.975\ mA$

Verify: $\frac{I_C}{I_B} = 78 < \beta = 100$ ⟶ Assumption (✓)

(Am)

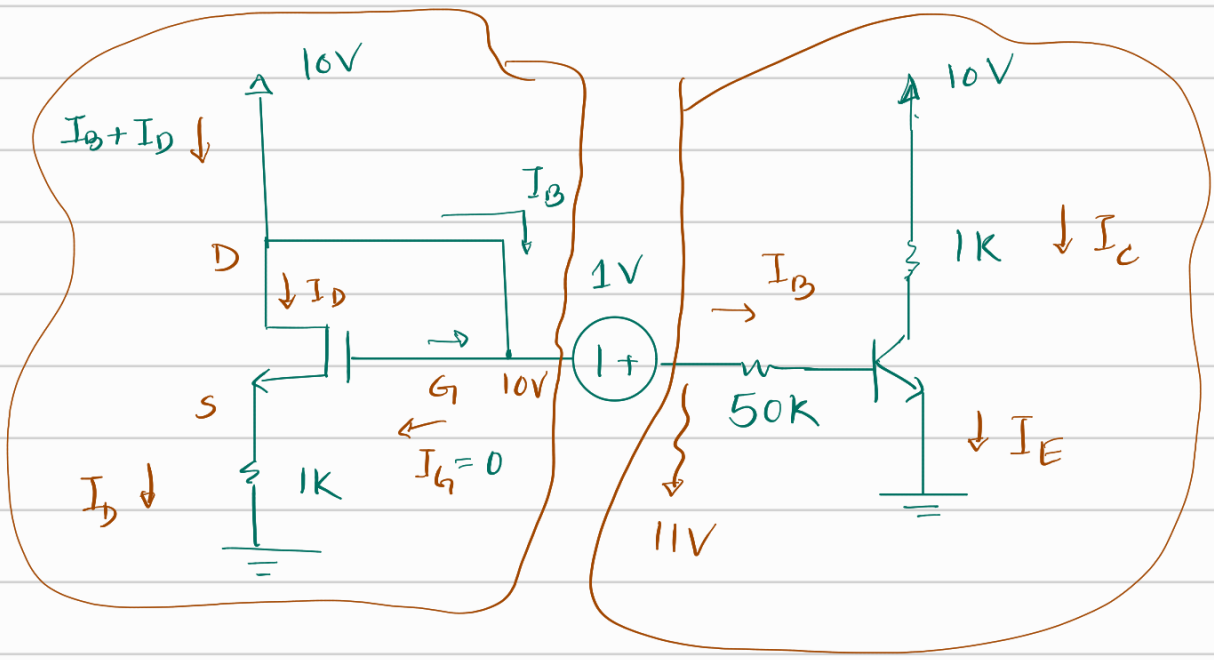
Mosfet + BJT :- Given, $V_T = 1V$, $K_n = 0.5mA/V^2$, $\beta = 100$

> - sat

V_{DS} $V_{GS} - V_T$

$V_D - V_S$ $V_G - V_S - V_T$

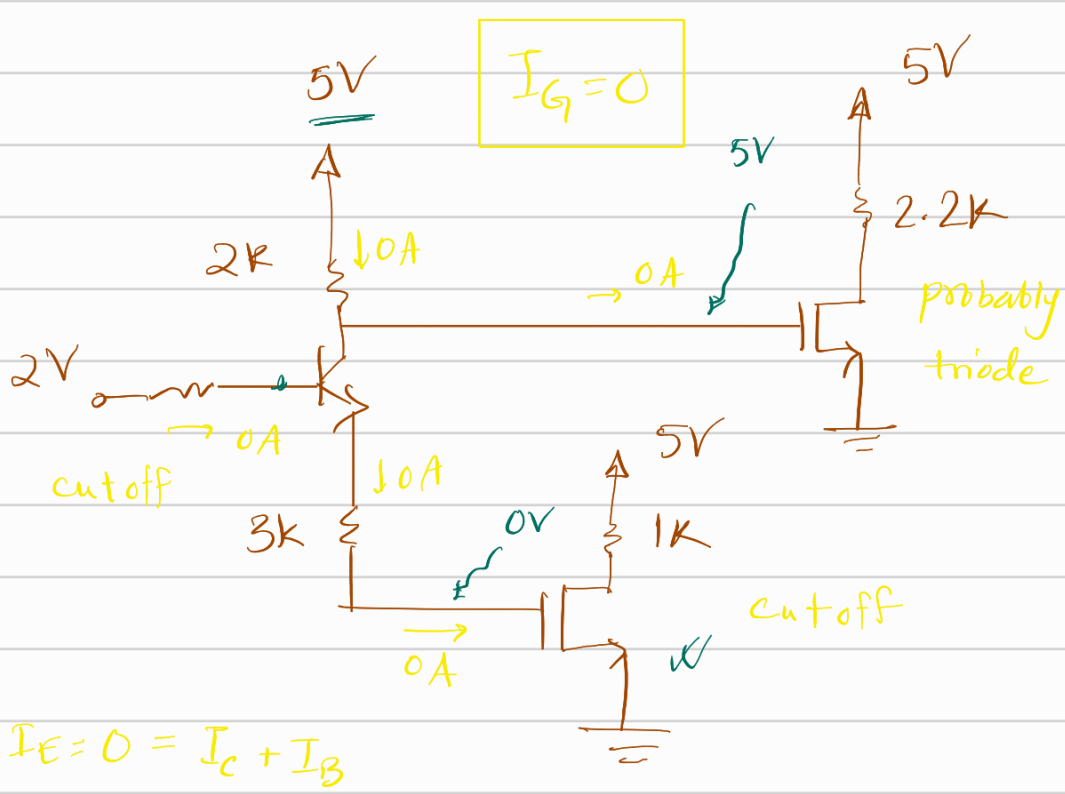
$-V_S > -V_S - V_T$



$\therefore V_G = 10V$

#

Mid	20%
Final	30%
Quiz	8%
Att	5%
Assign	12%
Lab	25%



$I_E = 0 = I_C + I_B$