# Final Assignment

**BRAC University**

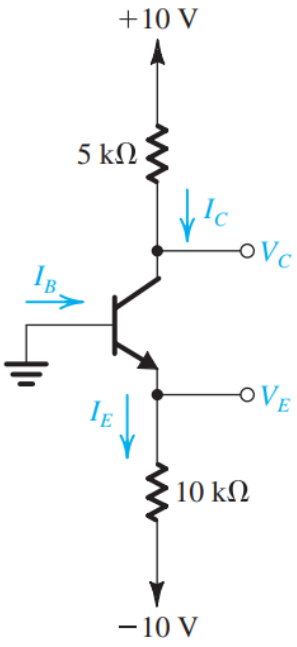
Semester: Spring 2023
Course No: CSE251 Course Title: Electronic Devices and Circuits

**Student IDs:**

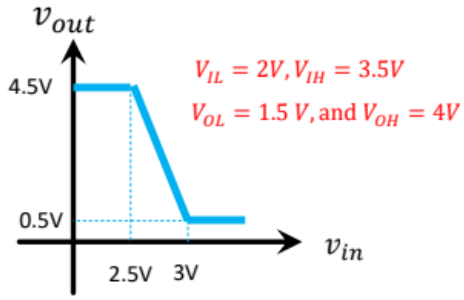
## Set-1

**(i)**

In the circuit shown in Fig. the voltage at the emitter was measured and found to be –0.7 V. If $\beta = 50$, find $I_E$, $I_B$, $I_C$, and $V_C$.




**(ii)** Consider the circuit shown below. Does it follow the Static Discipline? Calculate the noise margins $NM_0$ and $NM_1$.



## Set-2

Consider an NMOS transistor fabricated with L = 0.18 μm and W = 2 μm. The process technology is specified to have **$k_n'$=387 μA/V²**, and **$V_T$ = 0.5 V**. Find **$V_{GS}$** and **$V_{DS}$** that result in the MOSFET operating at the edge of the saturation region with $I_{DS}$ = 100 μA. **If $V_{GS}$ is kept constant, find $V_{DS}$ that results in $I_D$ = 50 μA.**

For MOSFET

$$k = k_n' \frac{W}{L}$$

$$I_D = 0, \text{ if } V_{GS} < V_T$$

$$I_D = k\left[(V_{GS} - V_T)\,V_{DS} - \frac{1}{2}V_{DS}^2\right], \text{ if } V_{GS} \geq V_T \text{ and } V_{DS} < (V_{GS} - V_T)$$

$$I_D = \frac{1}{2}k\,(V_{GS} - V_T)^2, \text{ if } V_{GS} \geq V_T \text{ and } V_{DS} \geq (V_{GS} - V_T)$$

## Set-3

(i) Draw the I-V graph of a **MOSFET**. Identify all the regions. [You have to draw for at least three $V_{GS}$ values and mark $V_{ov}$ on the graph.]
(ii) Draw the I-V graph of a **BJT**. Identify all the regions. [You have to draw for at least three $I_B$ values on the graph.]