Assignment 03

BRAC University

Semester: Spring 2024

Course No: CSE251 Marks: 40

Course Title: Electronic Devices and Circuits Deadline: April 10, 2024-11:59 pm

Faculty: AGS

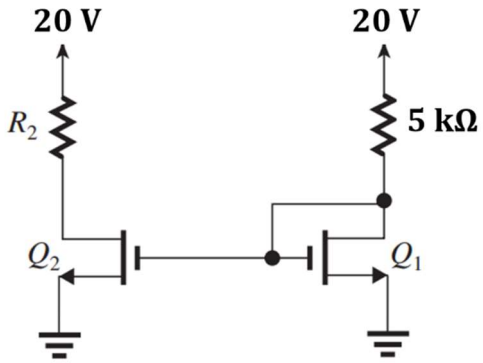
1. (CO1)

a) **Using** ideal MOSFETs (S-model) to implement the function-

f= $\left(\left(\overline{A \cdot \overline{C}}\right) + B + D\right) \cdot E$ [5]

b) **Draw** VTC of 2 input NOR Gate. [5]

2. (CO2) [10]



In the circuit above, the MOSFETs have the following parameters, k'n=2 mA/V2, W/L= 2.5, VT=0.5 V.

(a) **Find out** the operating mode of Q1 [Hint: For Triode mode Vds<Vov and for Saturation Vds>= Vov] [3]

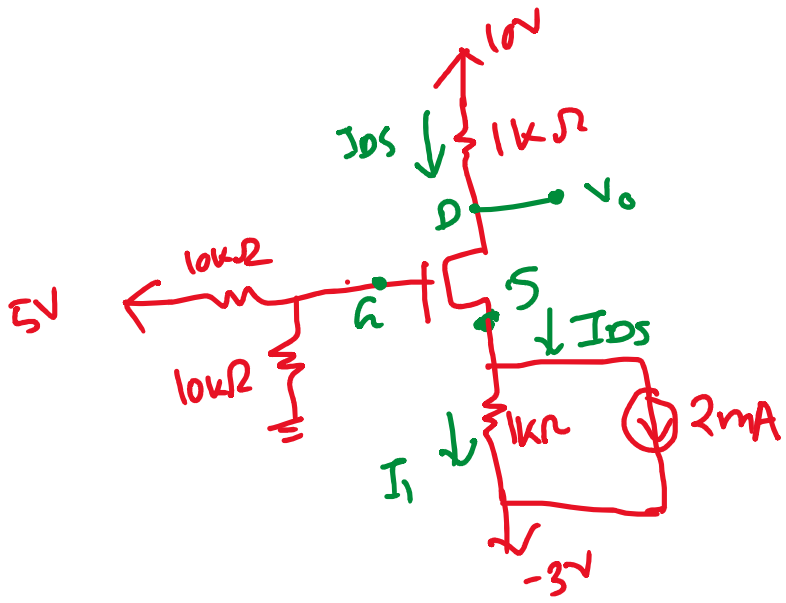
(b) **Determine** the value of R2 that results in Q2 operating at the edge of the saturation region. [3]

[**Hint:** at the edge of the saturation region $V_{DS}= V_{OV}$]

(c) **Calculate the on-state resistance,** Ron for Q2. [2]

(d) An inverter is designed using Q2 and a 10k resistor. **Draw** the VTC graph for the inverter.[2]

3. (CO2) [10]
Analyze the circuit to find I_{DS} and V_O using Method of Assumed State. You must validate your assumptions.
[**Hint:** Gate current I_G= 0mA. Assume I_{DS}= x, Apply KCL at source (S) terminal to find relation between Vs and I_{DS}]



V_T= 1V

$k = kn' \frac{W}{L} = 2\ mA/V^2$

4. (CO2) [10]
Analyze the circuit to find I_D and V_{DS} using Method of Assumed State. You must validate your assumptions.
[**Hint:** Gate current I_G= 0mA. Assume I_D= x, Express Vs & V_D in terms of I_D]

V_T= 1V

$k = kn' \frac{W}{L} = 2\ mA/V^2$