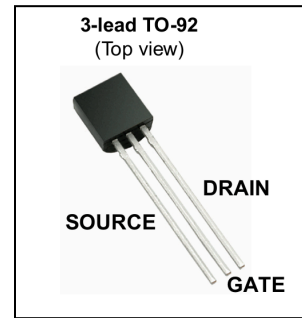


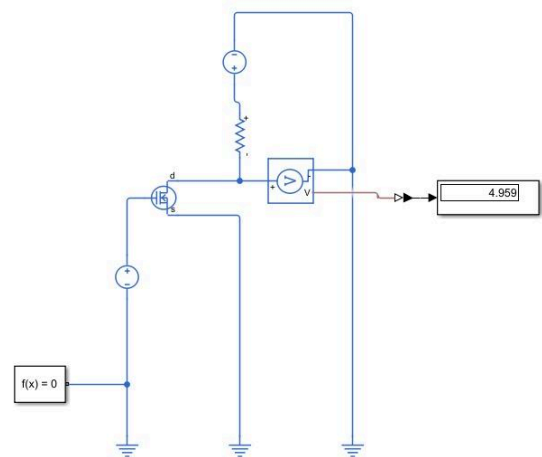
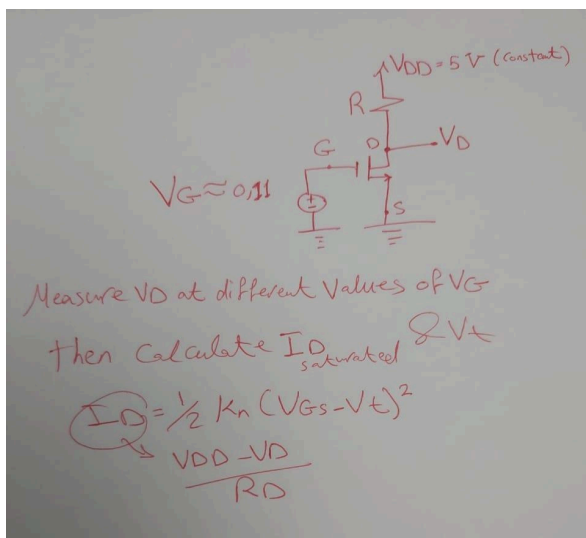
MOSFET

In this Lab, we were required to apply what we studied about MOSFETs, were we had a peak into it's various types in the market, we ended up using the 2N7000 (N-Channel Enhancement-Mode Vertical DMOS FET) Model, where it had many advantages and was a decent choice for this Lab.



We then constructed the circuit as required, connected the Gate voltage V_G to A Tunable DC supply voltage $[-15 \rightarrow 15]V$ and connected the Source terminal to the ground, finally connected the drain in series with a 1K resistor and both to a constant DC supply (5V)

After connecting the circuit as shown in the simple diagram and in the schematic below



We then faced a problem with the readings, we started with couple readings but the V_d was too small (almost reached 0), so we changed the resistor to be 100 ohm instead, and rewrote the table as below, we increased the V_g slightly as shown in readings 1, 2, note that the V_t denoted for the 2N7000 was in the range between (0.8, 3) V, so we then set the V_g to 1.34, we were sure we the Channel was **ON** and the operating region was in **saturation**

And here we show the used Laws in this Lab

$$I_D = \frac{1}{2} k_n (V_{GS} - V_T)^2 \quad \text{---} \quad g_m = \sqrt{2k_n I_D} \text{ @ saturation region, } k_n = \frac{(g_m)^2}{2I_D}$$

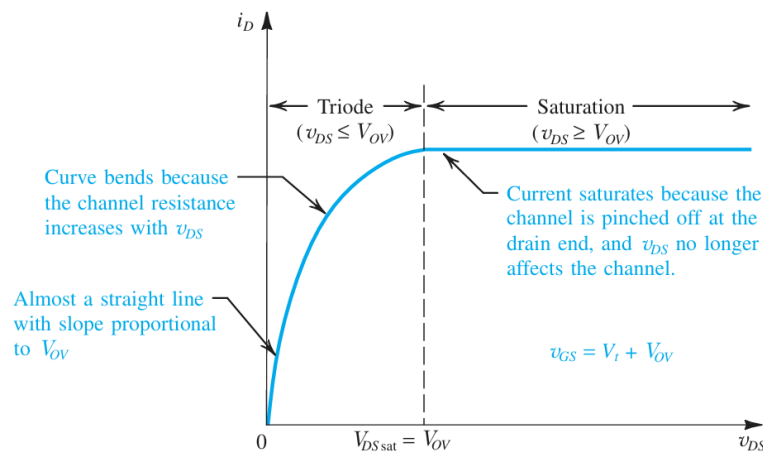
g_m was given in the datasheet to be $100 \Omega^{-1}$ or equivalently $0.1 S$, k_n was calculated to be 25mA/V^2

As we can see here, the transition occurred when changing V_G to be more than V_T denoted in the datasheet (0.8) and only then, a drop between V_D and V_{DD} occurred starting from **idx#3**

Reading idx	VGS (V)	VT (V)	ID (mA)	VD (V)	VDD (V)
1	0.15	—	0	5.02	5.02
2	0.38	—	0	5.02	5.02
3	1.34	1.185	0.3	4.99	5.02
4	1.44	1.2034	0.7	4.95	5.02
5	1.54	1.1712	1.7	4.85	5.02
6	1.94	0.91634	27.7	1.94	4.91

Output Plots:

id -vds characteristic normal plot from reference



Region we were operating in → **Saturation**

Collective Summary:

- MOSFETs can be very useful in a variety of applications, different configurations and modes can be utilized for multiple situations. Lab experiments occasionally produce errors due to equipment and physical noise, We are truly grateful for Eng. Alaa our TA in all Lab sessions, and all thanks to our Instructor Prof. Mohammad Isalm