Faculty of Engineering and Technology
Department of Electrical and Computer Engineering

ENEE 2103

CIRCUITS AND ELECTRONICS LABORATORY

Experiment #8, Pre-Lab #4

" The Field-Effect Transistor"

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Section: 1

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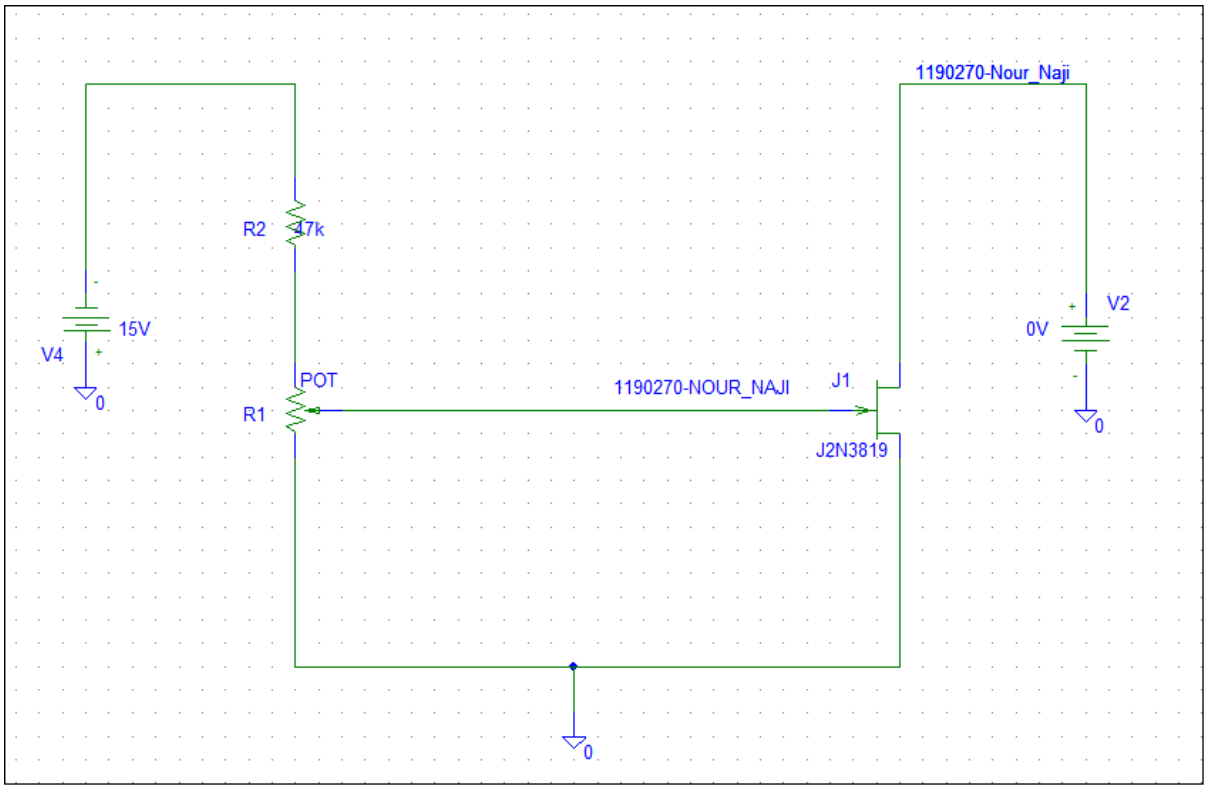
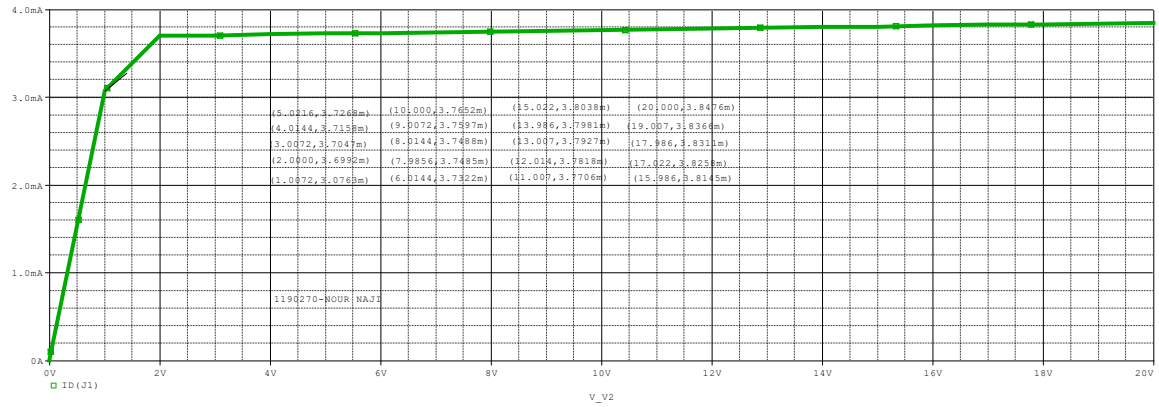
CHARACTERESTICS OF AN N-CHANNEL JFET





Questions

- From your graph, above which values of V_{DS} is I_D almost unaffected by V_{DS} when V_{GS}=0?

  ⇨ after Vds ≈ 2 volt, Ids almost unaffected by Vds. Let us take Vds = 10 volt for example, changing Vgs will not change Id, since we will be in pinch off region.

- For a given value of V_{DS} , (say 10 V),do equal changes of V_{GS} cause equal changes of I_D?

  ⇨ Junction between the source and gate Reverse bias junction so the value of I_d is too small close to zero

- Can you measure I_G or is it too small?

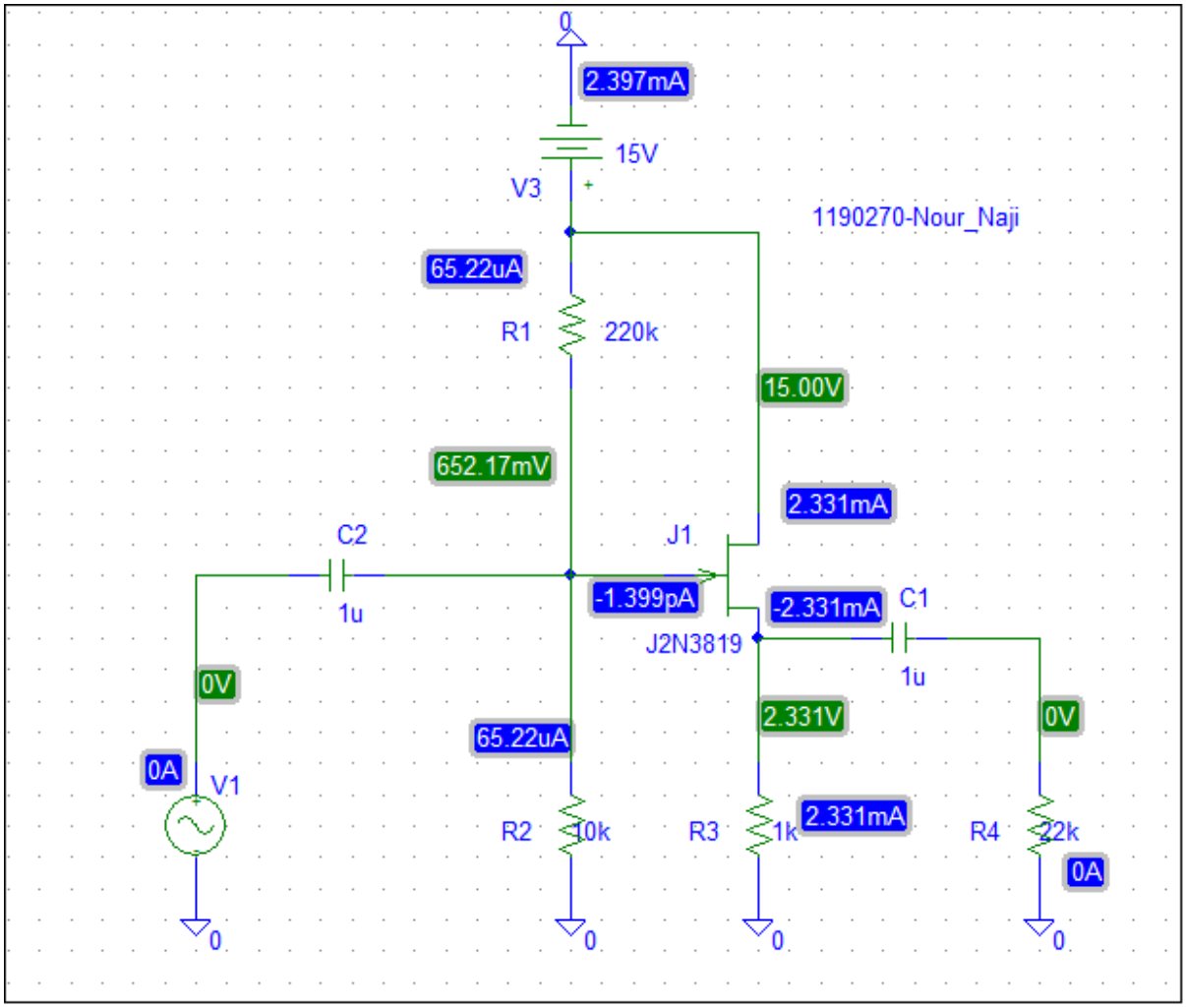
  ⇨ Too small

- From your graph, estimate the change in I_D for 0.5 change in V_{GS} when V_{DS} =10 V , and V_{GS} -1.0 V ,then find the transconductance of the transistor(g_m).

  ⇨ Transconductance $(Gm) = \frac{2 * Idss}{|Vp|}\left(1 - \frac{Vgs}{Vp}\right)$

  $= \frac{2 * 3.7268m}{|2|}\left(1 - \frac{-1}{2}\right) = 5.5902\ mV.$

COMMON DRAIN AMPLIFIER.

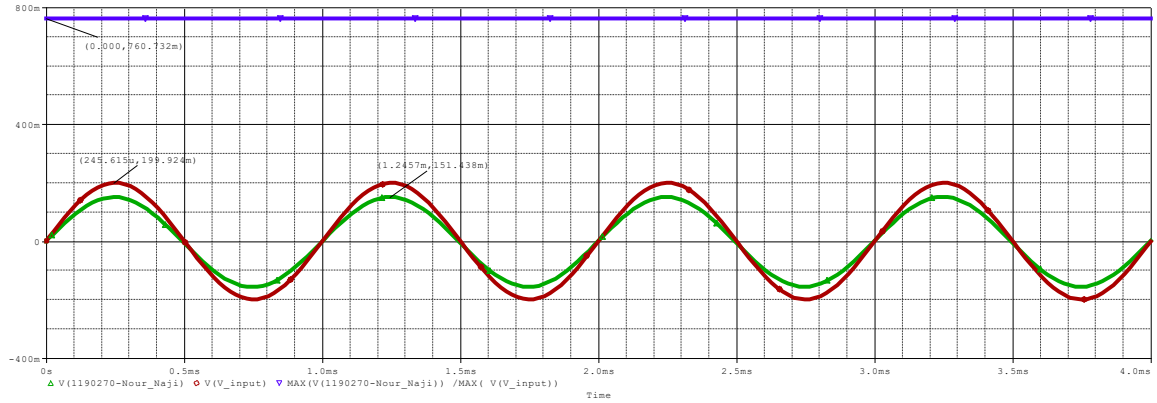


❖ DC voltages

- V_G = 652.17 mV
- V_S = 2.331 V

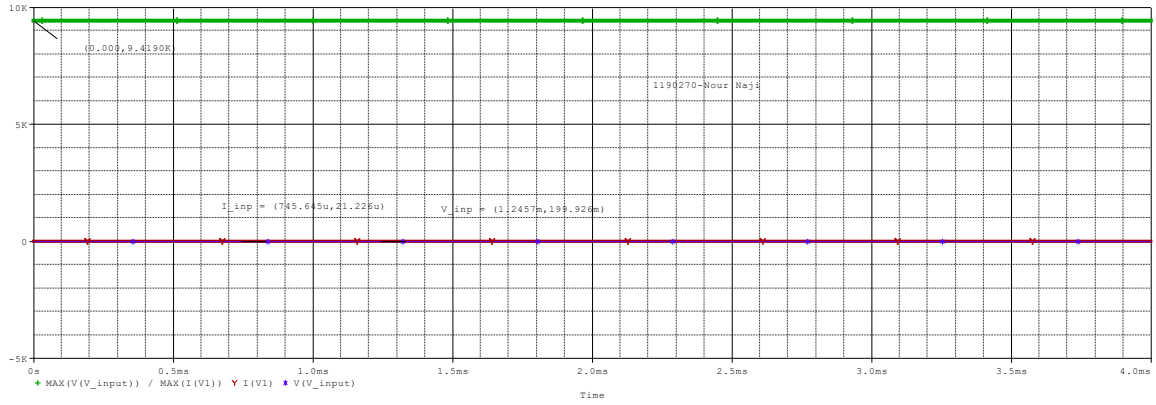
❖ Calculate the voltage gain and the phase shift between the input and output voltage.

- $V_{gain} = \frac{Vout}{Vin}$ = 760.732 m

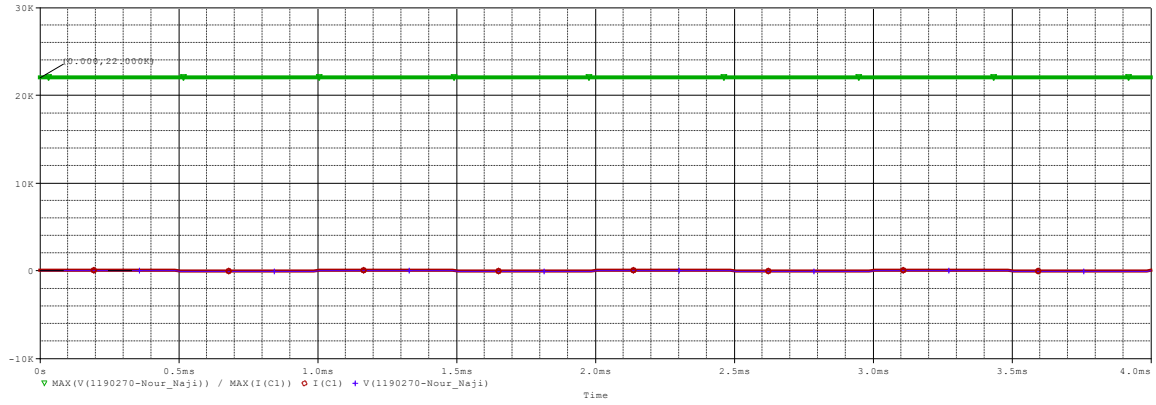


❖ Measure the values of Z_{in} and Z_{out} using the appropriate voltages and currents at the places shown in the previous figure.

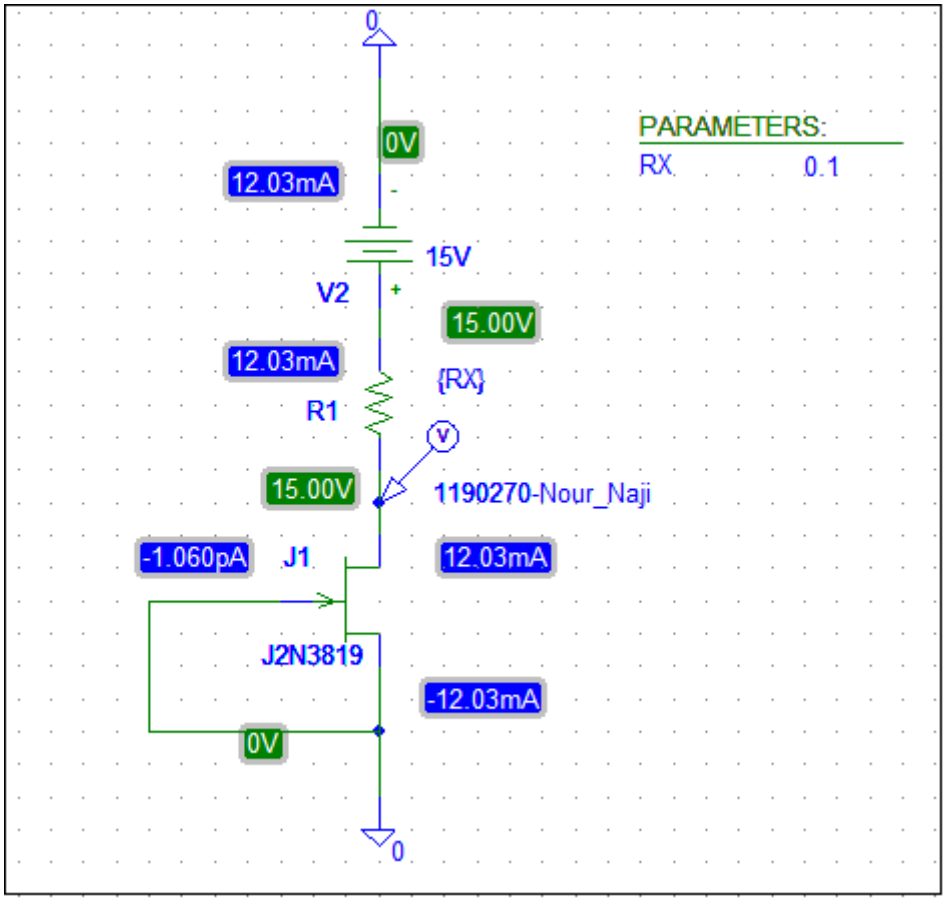
- $Z_{in} = \frac{Vin}{Iin}$ = 9.4190K



- $Z_{out} = \frac{Vout}{Iout}$ = 22.000K

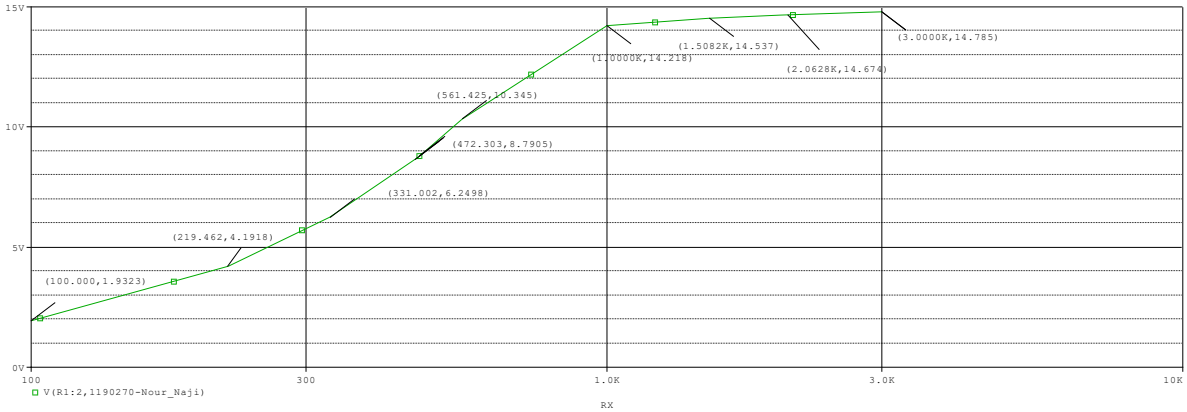


CONSTANT CURRENT SOURCE

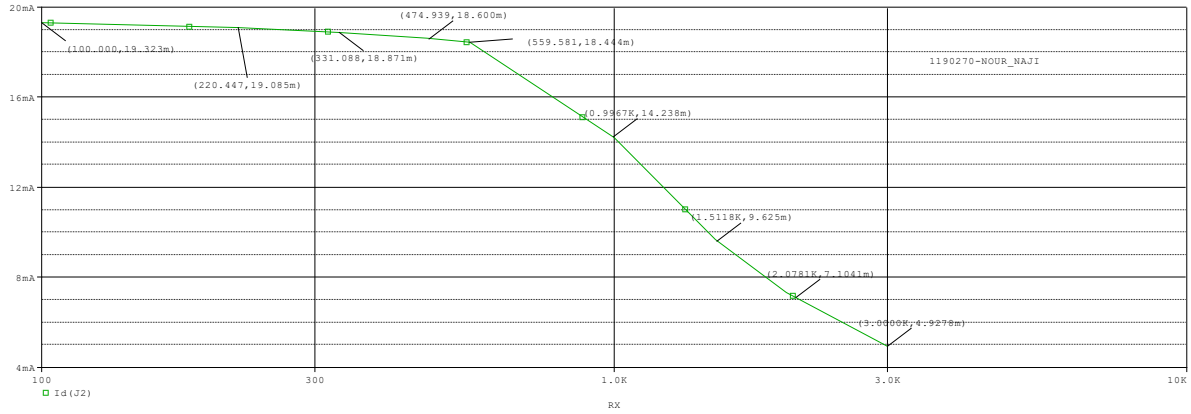


❖ Display V_L across the resistor and I_{DS}

V_L:



I_{DS}:



R_L(KΩ)	V_L(V)	I_D(mA)
0.1	1.9323	19.323
0.22	4.1918	19.085
0.33	6.2498	18.871
0.47	8.7905	18.600
0.56	10.345	18.444
1	14.218	14.238
1.5	14.537	9.625
2	14.674	7.1041
3	14.785	4.9278