Faculty of Engineering and Technology

Electrical and Computer Engineering Department

ENEE2103

Circuits and Electronics Lab

Experiment No.8 - Pre Lab No.7

The Field-Effect Transistor

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Section: 5.

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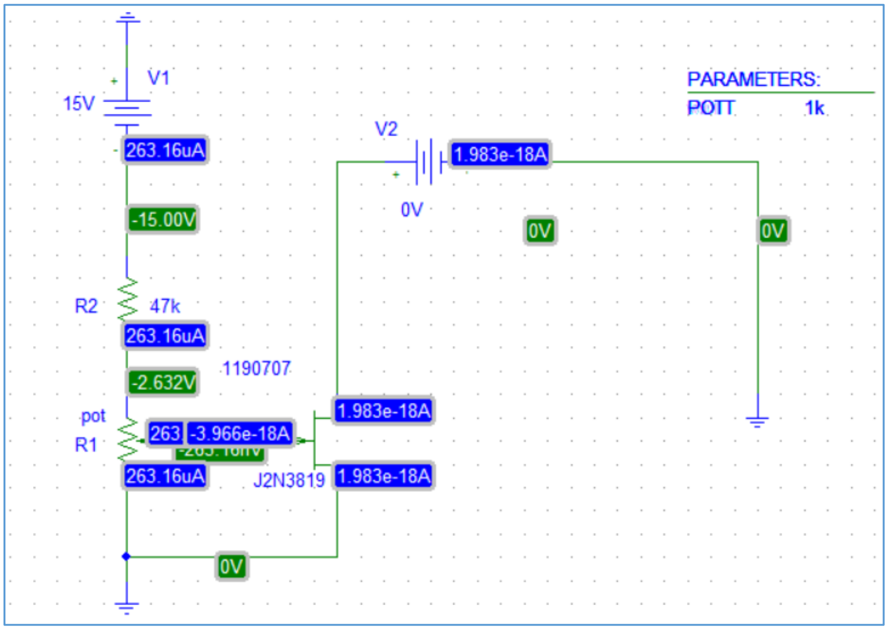


Figure 1 N-Channel JFET connection.

- **<u>Ids and Vds graph:</u>**

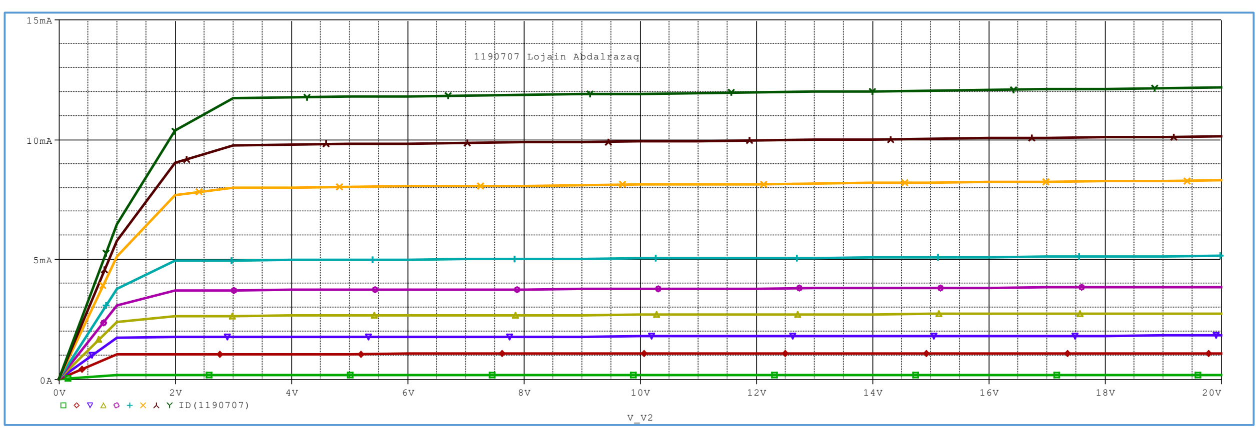


Figure 2 Ids and Vds graph.

- **<u>Questions:</u>**

1. **From your graph, above which values of VDS is ID almost unaffected by VDS when VGS=0?**
   By the following figure, the current stop increasing at Vds= 2.98 V, and from this value the Ids stop increasing and became unaffected by VDS.

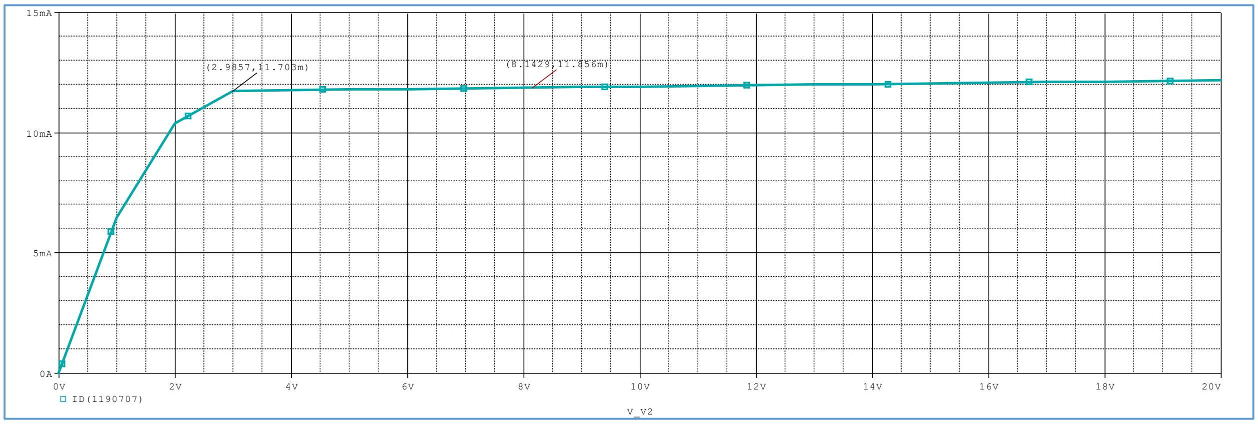


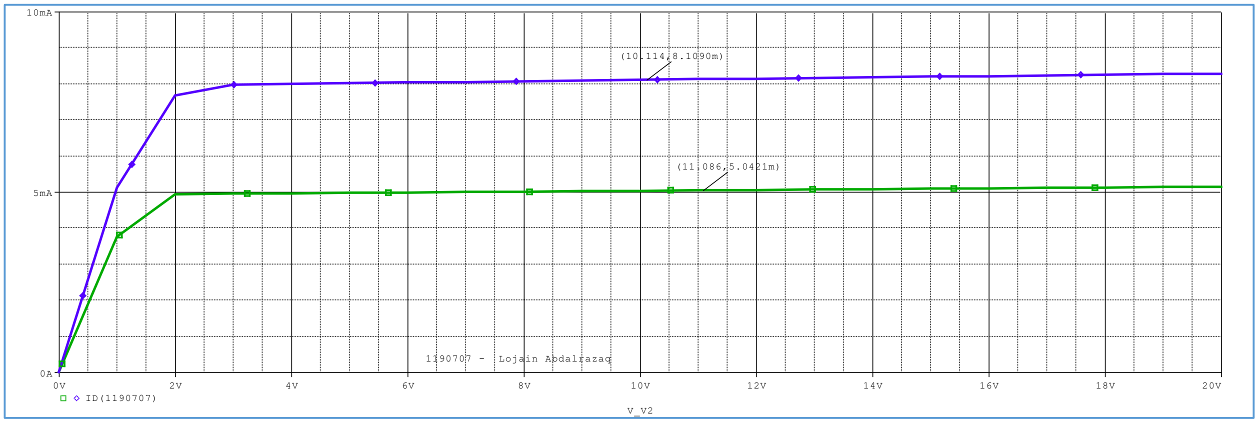
Figure 3 When IDS became unaffected by Vds.

2. **For a given value of VDS , (say 10 V),do equal changes of VGS cause equal changes of ID?**

   No, the changes when Gm=1.

3. **Can you measure I_G or is it too small?**
   No, its too small.

4. **From your graph, estimate the change in ID for 0.5 change in VGS when VDS =10 V , and VGS -1.0 V ,then find the transconductance of the transistor(gm).**



Id= 8.1-5.04 → 3.06 mA, the change in the VGS=0.5.

Transconductance(GM)= 3.06m / 0.5 = 6.12 mV.

2. Common Drain Amplifier

- **<u>Connecting the circuit and running it:</u>**

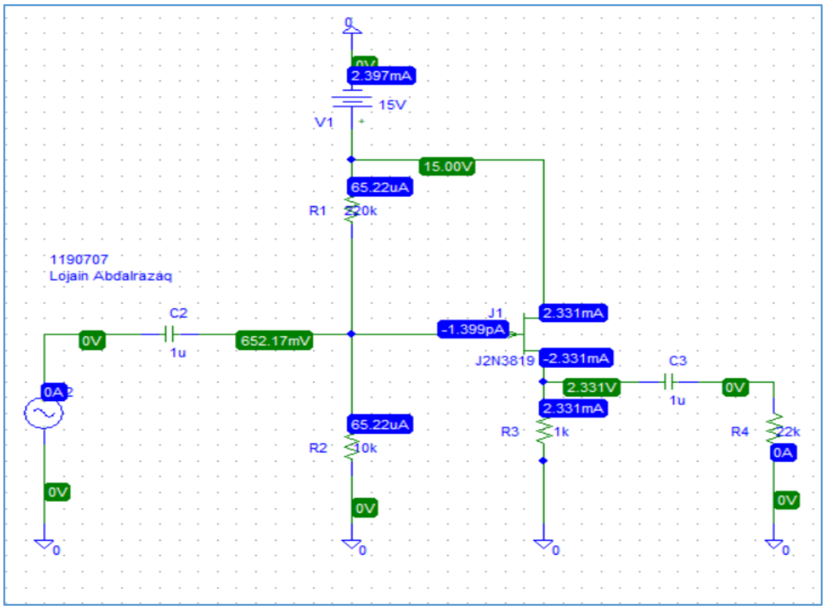


Figure 4 Common Drain Amplifier Circuit.

- **<u>Measuring DC voltages of V_G and V_S:</u>**

Vg = 652.17 mV.
Vs = 2.331 V.
Vgs = Vg – Vs = 652.17 m- 2.331=-1.66883 V.

- **<u>Calculating the voltage gain and phase shift:</u>**

The voltage gain = Vout / Vin = 760.45 mV, **with phase shift 0 degrees.**

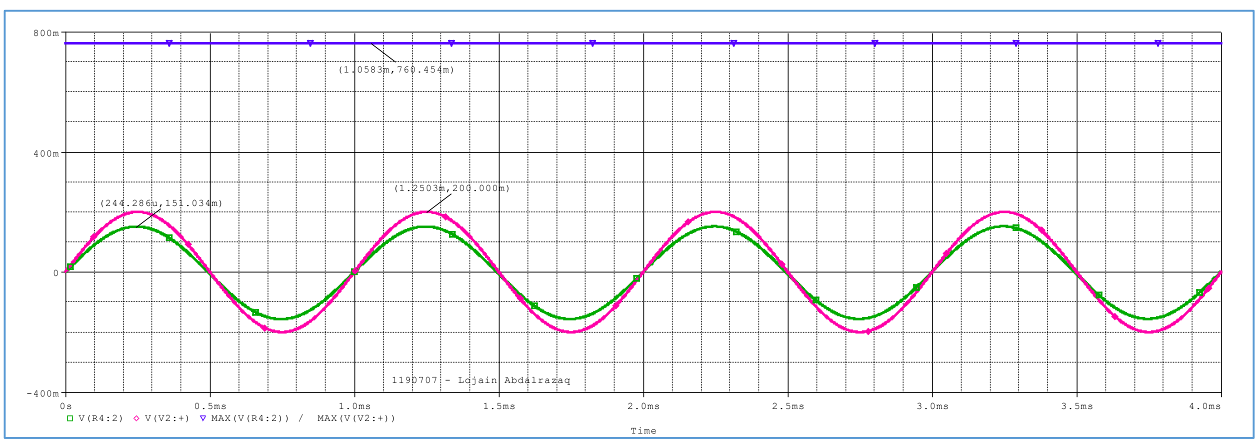


Figure 5 Voltage Gain.

- **Calculating the Zin and Zout:**

$$Zin = \frac{Vin}{Iin} = 9.424 \text{ kohm.}$$

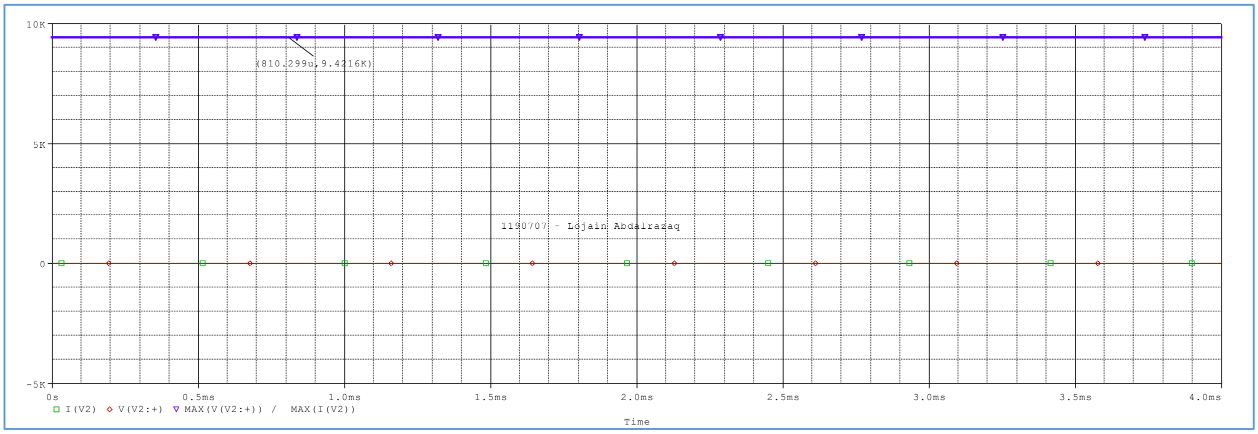


Figure 3 The input Impedance.

$$Zout = \frac{Vout}{Iout} = 9.42 \text{ kohm.}$$

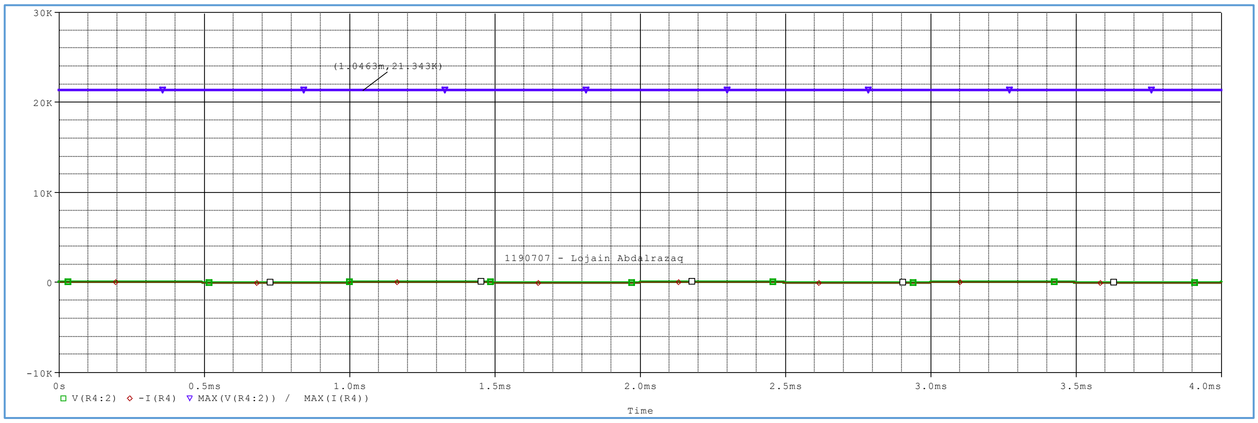


Figure 6 The output Impedance.

3. Constant Current Source

- **<u>Connecting the circuit using PSpice and running it:</u>**

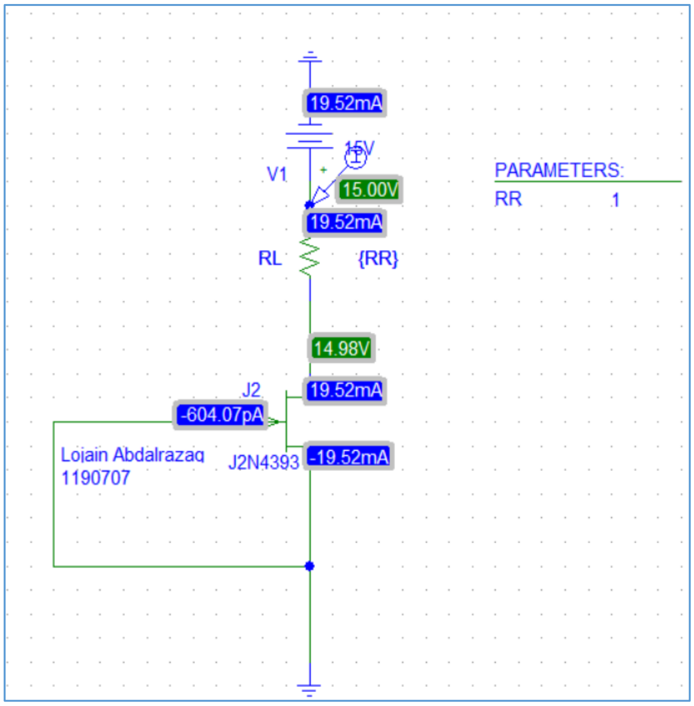


Figure 7 Constant current source circuit.

- **<u>Displaying Vs across the resistor</u>**:

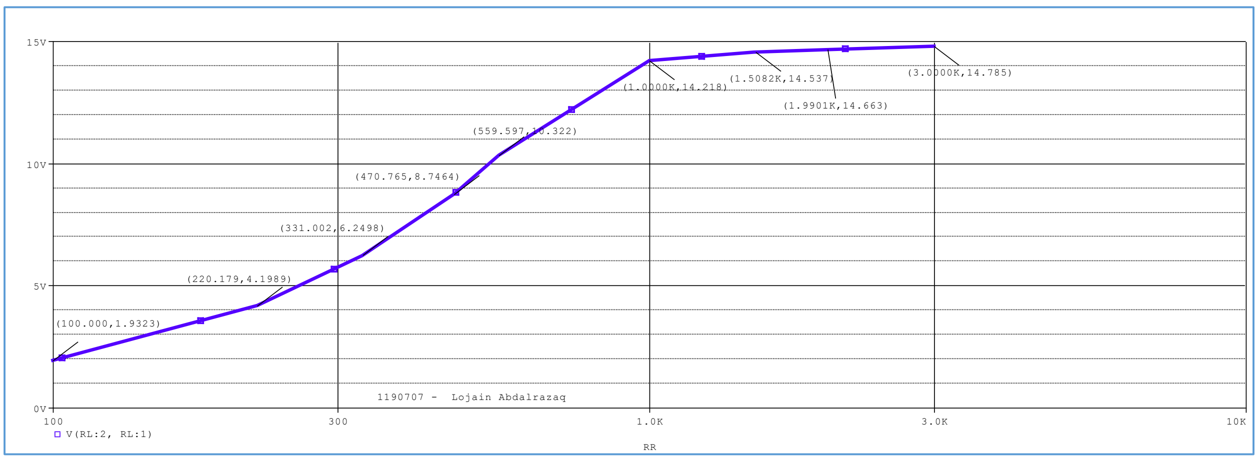


Figure 8 Vs across the resistor.

- **<u>Displaying Ids across the resistor</u>**:

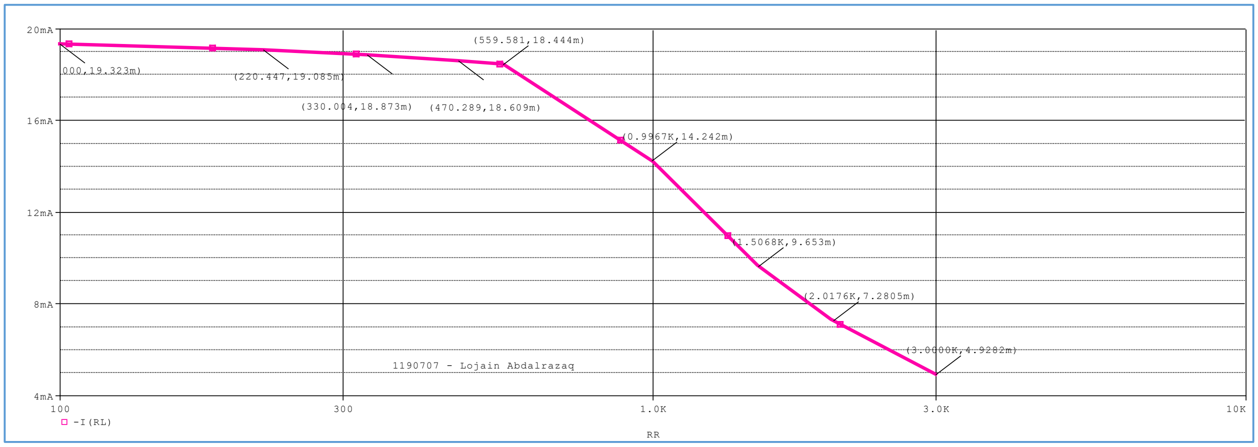


Figure 9 Ids across the resistor.

Table 1 The Vs and Ids across the resistor table.

RL(Kohm)	**VL(V)**	**Ids(mA)**
0.1	1.9323	19.33
0.22	4.1989	19.085
0.33	6.2498	18.873
0.47	8.7464	18.609
0.56	10.322	18.444
1	14.218	14.242
1.5	14.537	9.653
2	14.663	7.2805
3	14.785	4.9282