BIRZEIT UNIVERSITY

Faculty of Engineering & Technology
Department of Electrical & Computer Engineering
ENEE2103-Circuit And Electronics Laboratory

PreLab#8 :The Field-Effect Transistor

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I. CHARACTERESTICS OF AN N-CHANNEL JFET.

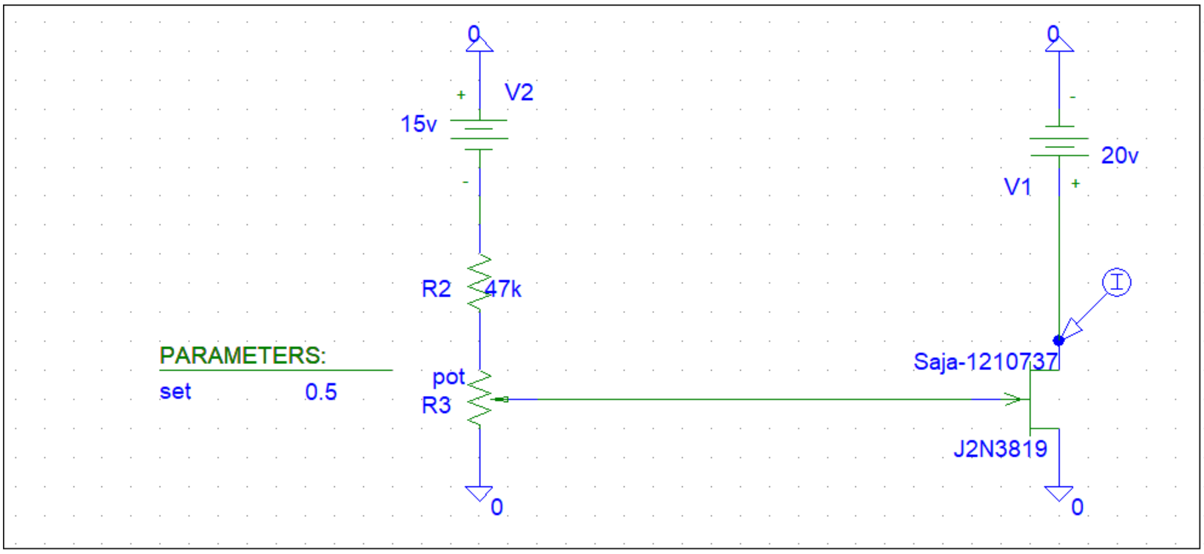

Figure1 :N-Channel JFET circuit

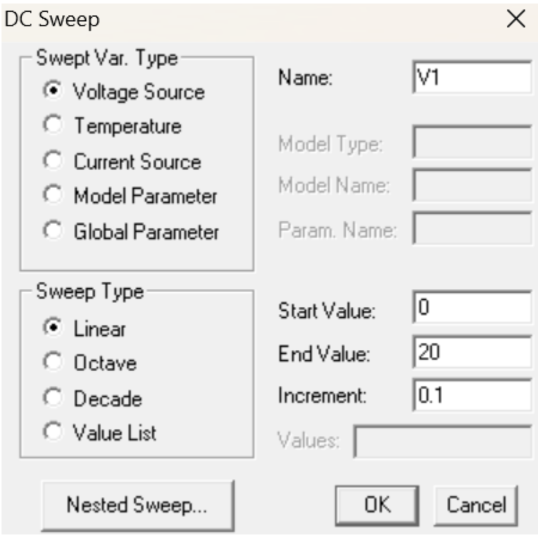

Figure 2:DC Sweep setting

Figure 3:potentiometer setting

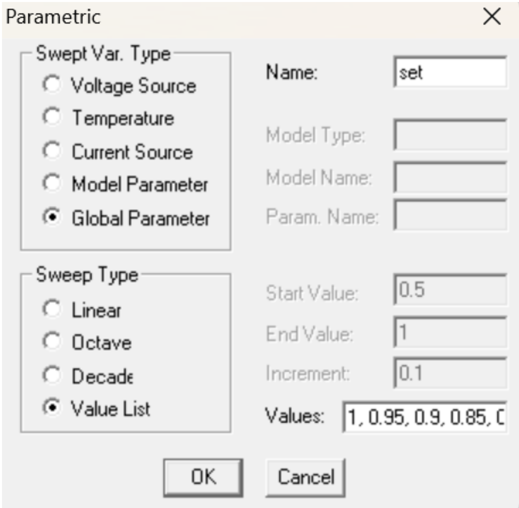

Figure 4:Parametric setting

The taken step parameter values are: (1, 0.95, 0.9, 0.85, 0.8, 0.7, 0.5).

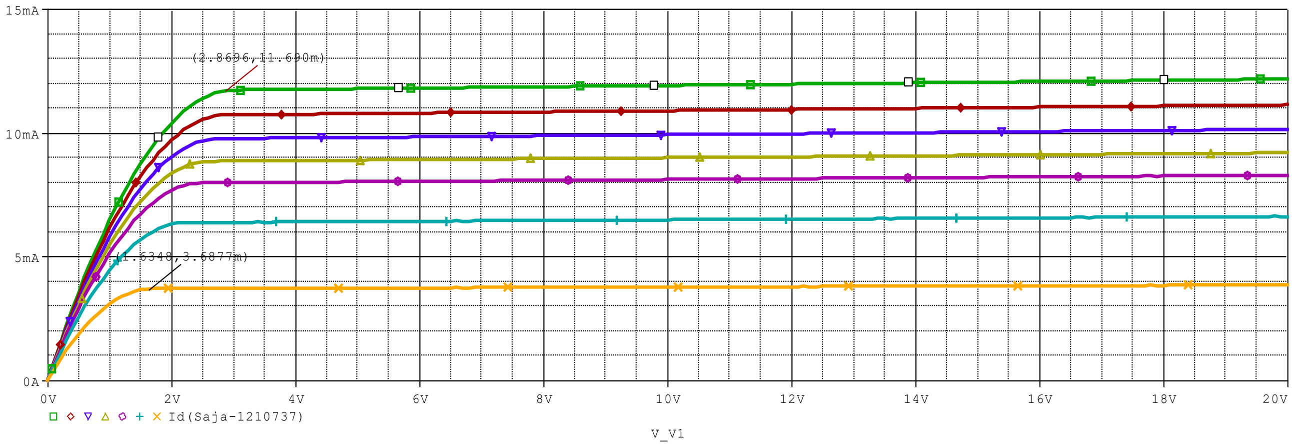

Figure 5:IDS as a function of VDS graph

Questions:

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

As shown in the figure above IDS stops getting effected of the values of VDS around VDS = 2V, when VGS = 0V. When the step parameter equals 0.5, IDS settles at VDS = 1.6348, and its 3.6877mA.

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

No, The changes of VGS doesn't effects the changes IDs.

→ Can you measure IG or is it too small?

IG can't be measured, as it is too small.

→ 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 trans conductance of the transistor(gm).

transconductance = g_m =(change in I_D)/(change in V_{GS}).

gm= 2× (IDss / |VP|) × (1- (VGS/VP))

= 2× (3.6877/2) ×(1- (-1/2))

=5.53155mho

Change Estimated in ID is ID=5.53155*0.5=2.765775mA

II. COMMON DRAIN AMPLIFIER.

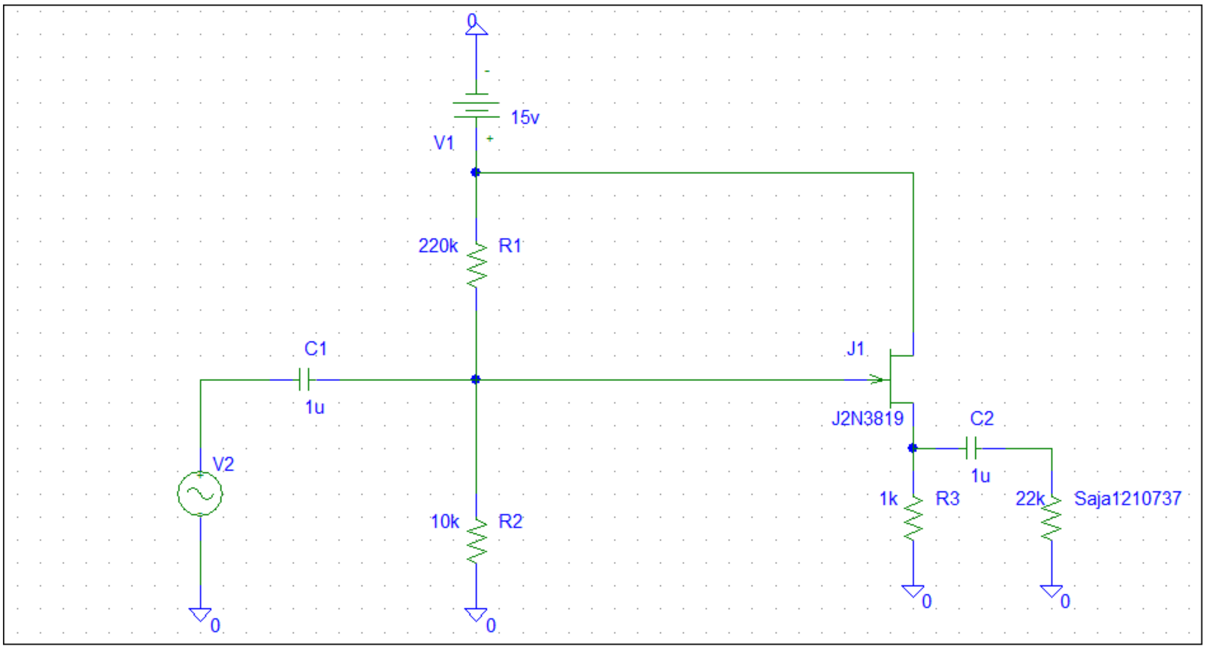

Figure 6:Common drain circuit

Then I Set the sine wave generator to a frequency of 1 kHz and turn its output amplitude to zero, so there is no signal input to the circuit ,this to find DC voltage for Vs and VG.

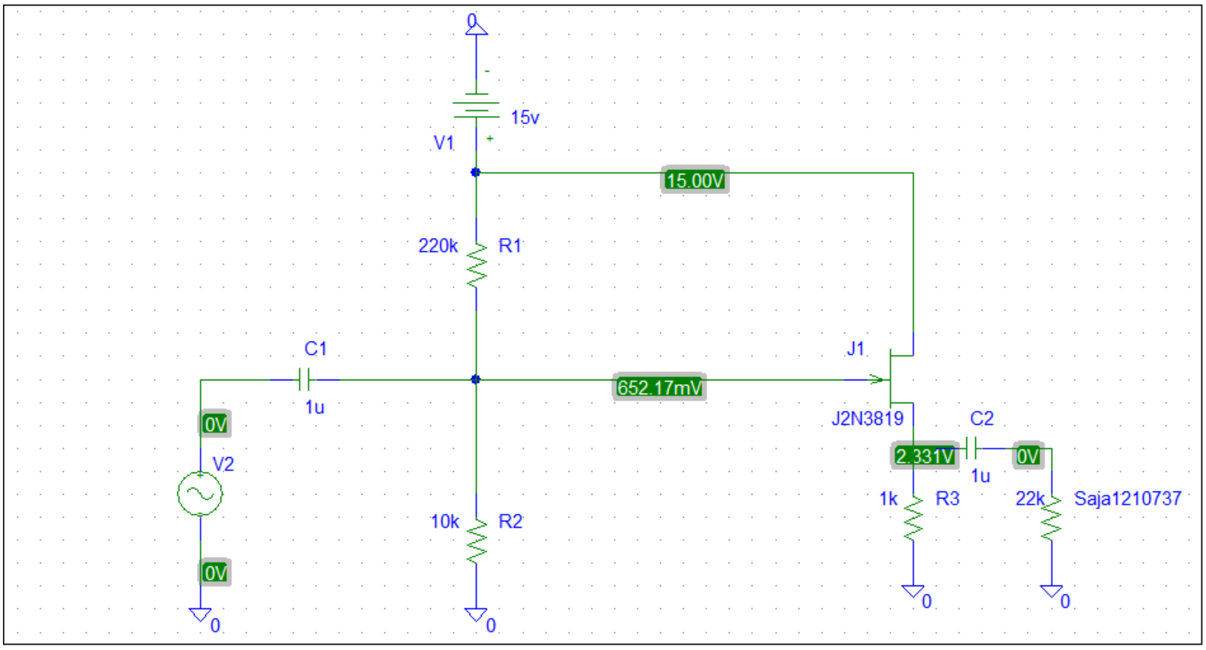

Figure 7:Comman drain circuit voltage

VG=652.17mV , Vs=2.331v

Now apply an input of 0.4 volts peak-to-peak from the generator, 1 kHz and observe the output.

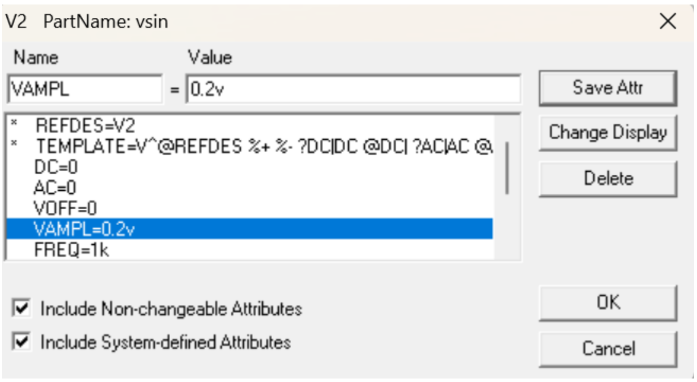

Figure 8:Vsin setting

I set VAMP to 0.2 because 0.4 Vp-p mean that Vp=0.2.

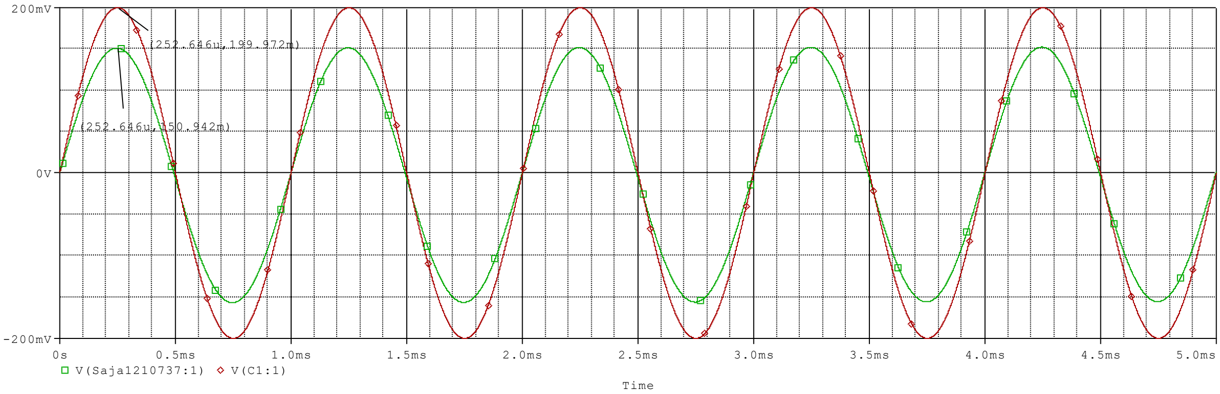

Figure 9:Vin and Vout plot

The voltage gain= Vo/Vi=150.942m/199.972m=0.7548

The phase shift = 0

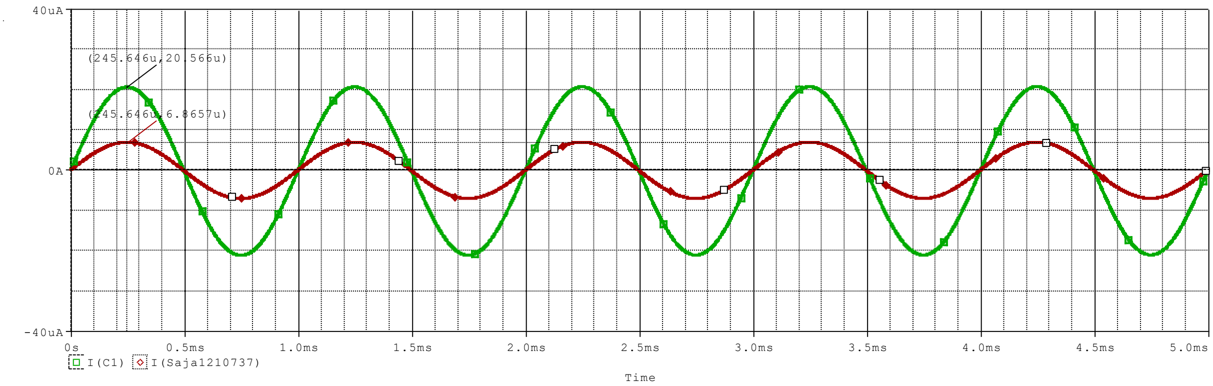

Figure 10:Io vs Iin plot

The current gain=Io/Iin=6.8657u/20.566u=0.3338

Zin =Vin/Iin=199.972m/20.566u=9723.427Ω

Zout=Vout/Iout=150.942m/6.8657u=21.985k Ω