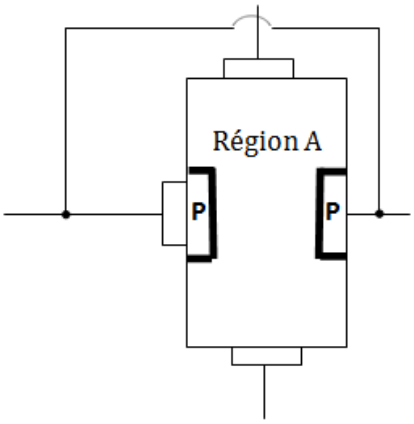
Recitation : 6

Exercise 1

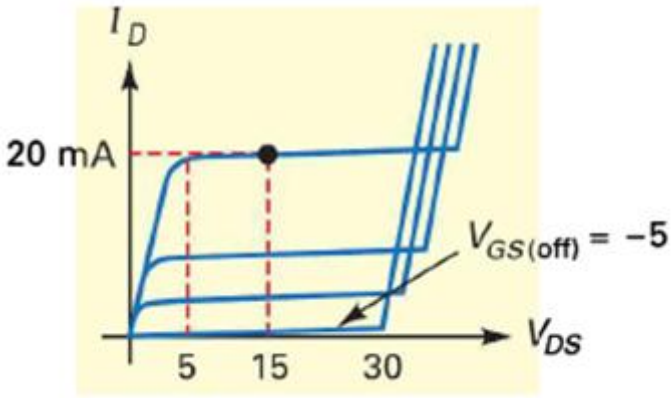
We consider the JFET transistor represented by the figure below.



1. Comment s'appelle les deux régions en gras ?
1. **What are the two regions in bold called?**
2. **What does region A represent? what type should it be? Name the terminals.**
3. **What is the type of transistor represented by the diagram above? give its symbol.**
4. **Plot the output characteristic of the JFET transistor for VGS0, VGS1, VGS2 with VGS0>VGS1>VGS2. Specify the ohmic zone and the breakdown zone on the transistor characteristic.**
5. **Under what condition is the JFET transistor in the blocking region?**

Exercise 2

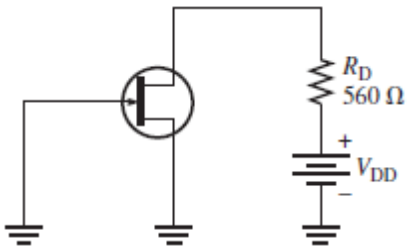
The characteristics of a JFET transistor are given in the figure below.



1. What is the IDSS current value?
2. What is the maximum VDS voltage in the ohmic region?
3. From what limit value of the VDS voltage does the JFET behave as a current source?

Exercise 3

We consider the circuit in the figure below:

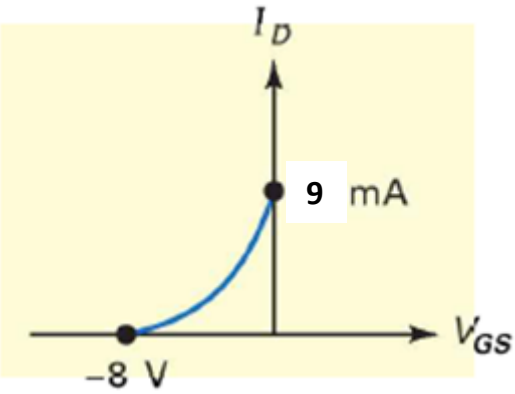


VGS(off) = – 4 V et IDSS = 12 mA.

1. Determine the minimum value of VDD necessary to put the transistor in the active region.
2. If VDD=15V, what should ID and VDS be?

Exercise 4

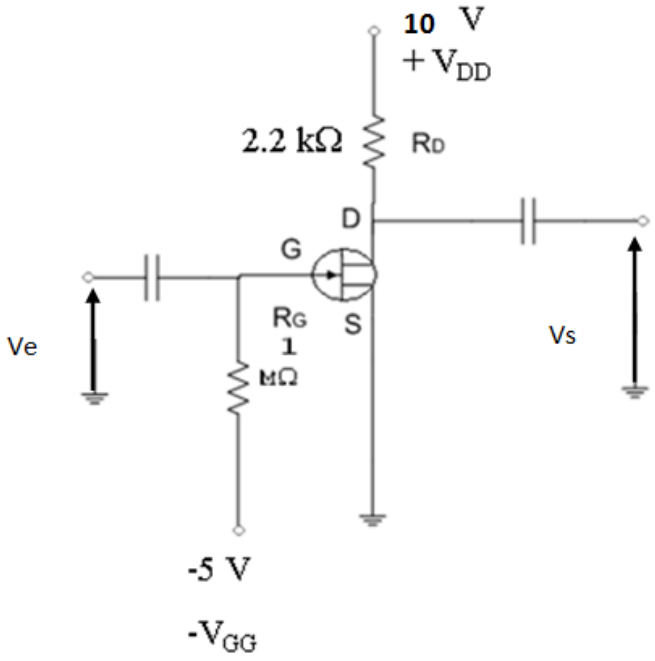
We consider the characteristic of a JFET given in the figure below.



1. Write the equation for the transductance of the JFET whose curve is shown in the figure above.
2. What is the drain current for the following VGS values: VGS=0V, -1V, and -4V?

Exercise 5

The figure below shows the bias circuit of a JFET transistor.

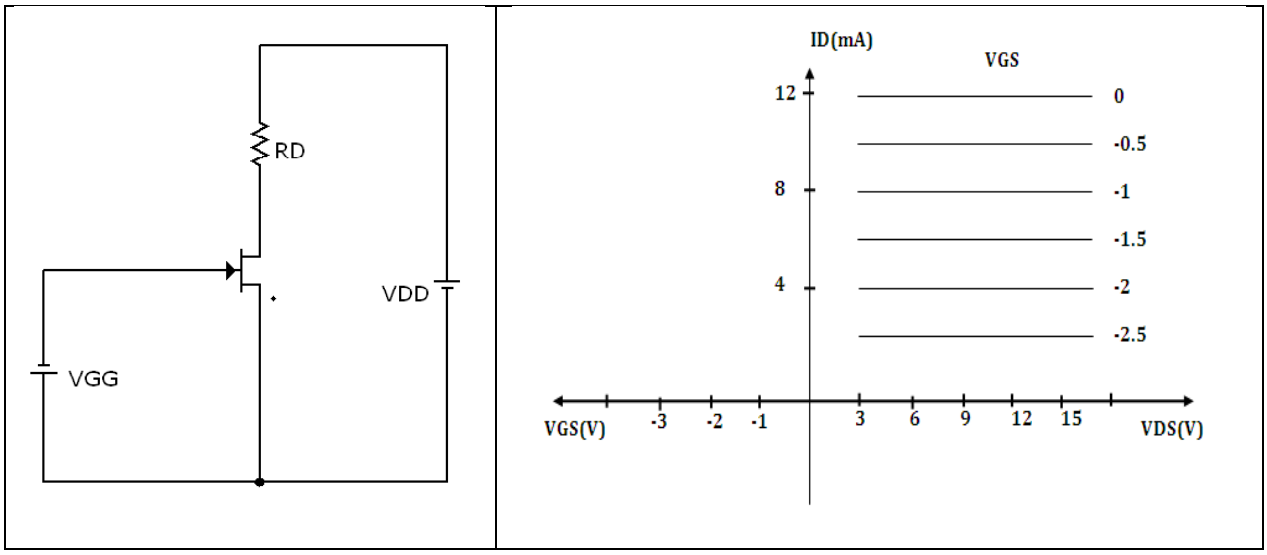


Given : VGSoff=-8V et IDSS=16mA.

- Determine the VGS, ID and VDS values of the circuit.

Exercise 6

The figure below shows the polarization circuit of a JFET using two separate sources; and its corresponding characteristic.



Part 1

The bias voltage is V_{DD}=12V with V_{GS}=-2V and R_D=1KΩ.

1. Give the equation of the static charge line.
2. What are the coordinates of the rest point?

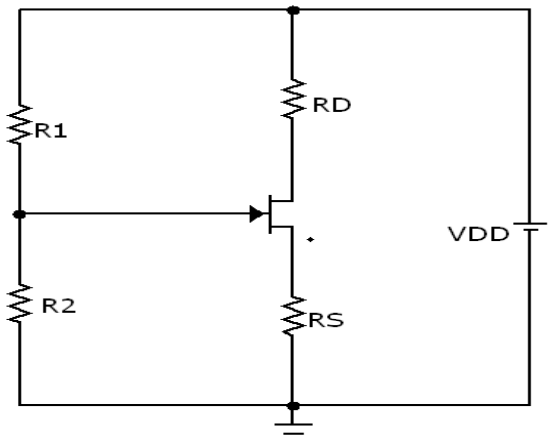
Part 2

In this case the rest point has the coordinates V_{DSQ}=9V et I_{DQ}=5mA. Knowing that V_{DD}=15V.

1. Find the value of the resistor R_D.

Exercise 7

The figure below shows the polarization circuit of a JFET per bridge:

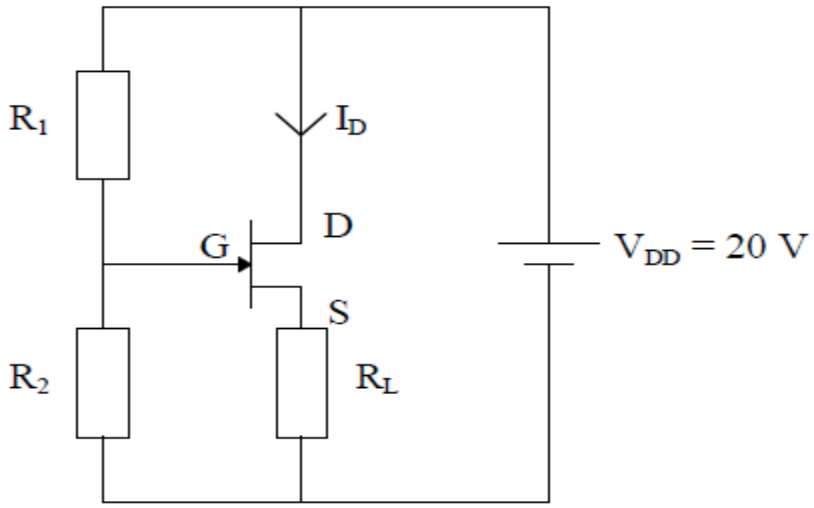


Given : R_1=6.8MΩ, R_2=1MΩ, R_D=3.3KΩ, R_S=2.2KΩ, V_{DD}=12V, VD=7V.

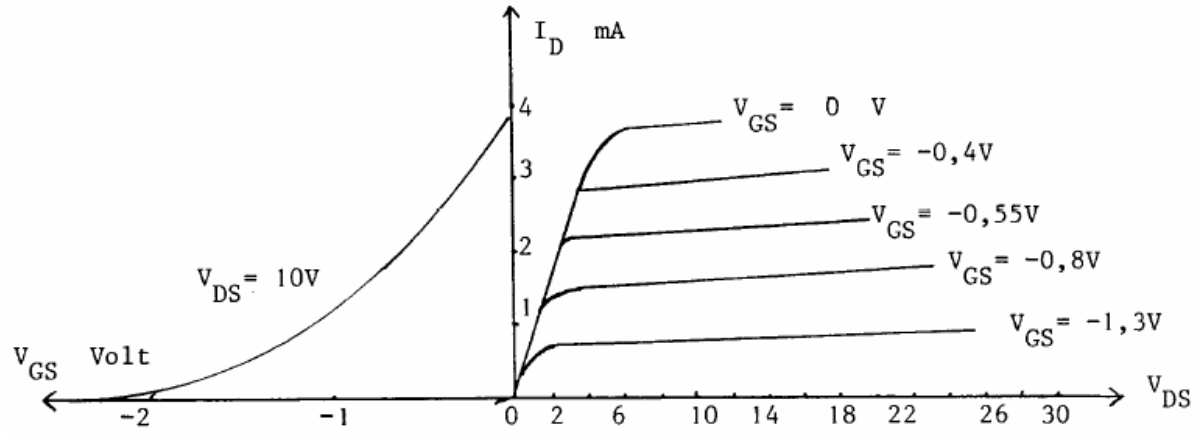
1. Determine ID and VGS of the JFET.

Exercise 8

We bias a field effect transistor using three resistors R_1, R_2 et R_L as shown in the figure below.



The characteristic network of the transistor is as follows:



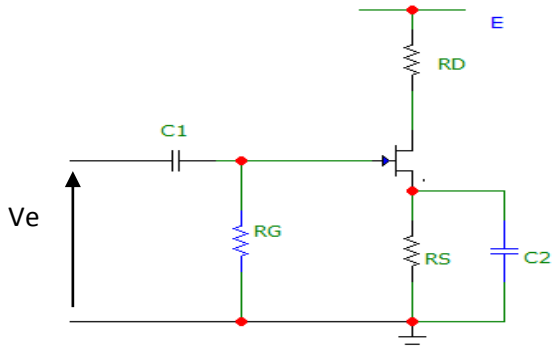
1. Write the equation for the static charge line of the transistor $I_D = f(V_{DS})$.

2. Draw the line of charge passing through the point $I_D = 4$ mA, $V_{DS} = 0$ V. Choose the operating point in the middle of the usable area. Deduce the value of the voltage V_{GS}.

3. Deduce the value of R_L.

Exercise 9

The JFET transistor below has gm0=8000µs.

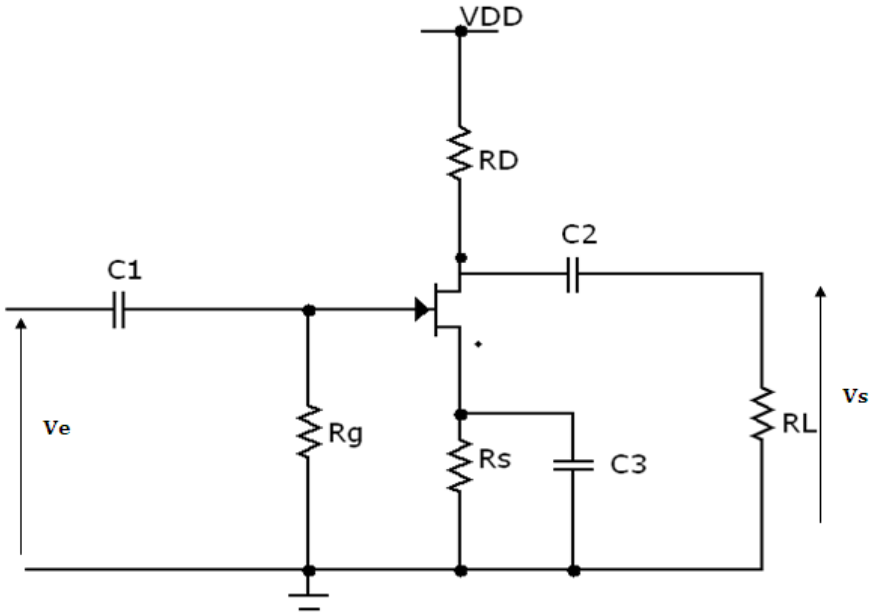


Given : E=24V, RD=4.7KΩ, RG=10MΩ.

1. Determine the value of Rs giving a polarization to $V_{GS} = \frac{V_{GSoff}}{4}$.
2. $I_{DSS} = 8mA$, determine V_{GS} for the value of Rs found above and calculate the corresponding value of V_{DS}.

Exercise 10

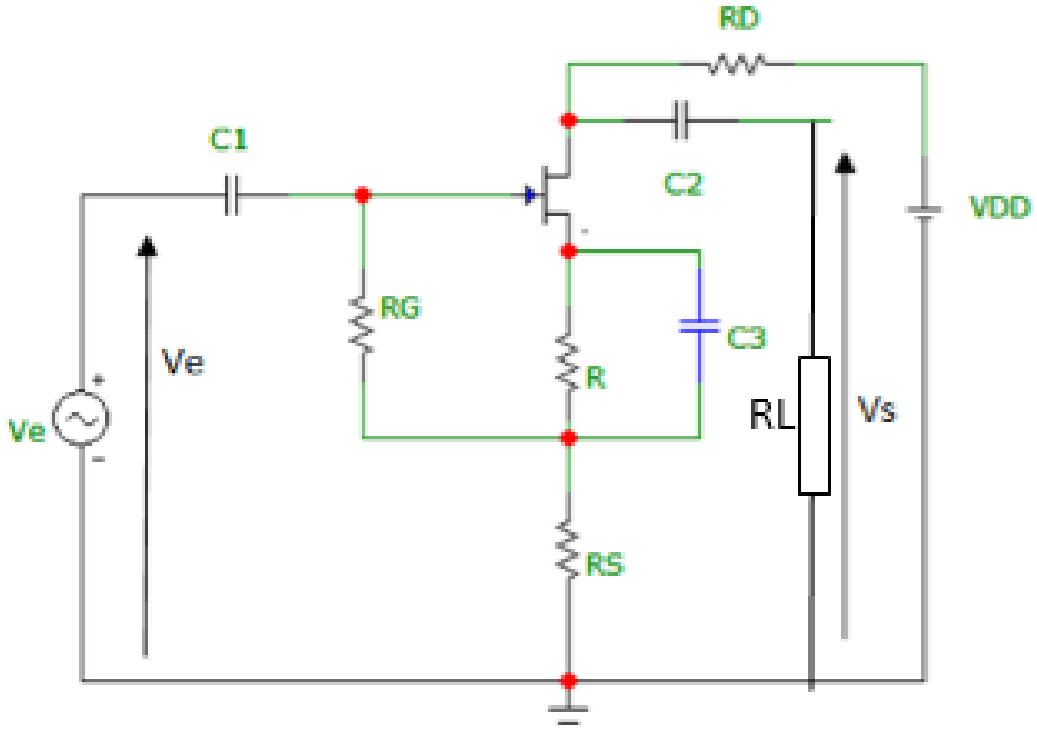
We consider the following assembly based on the JFET transistor:



1. Draw the equivalent diagram of the low frequency circuit.
2. Calculate the voltage gain, input and output impedance.

Exercise 11

We consider the amplifier circuit made up by using a field effect transistor (JFET).



1. Draw the diagram equivalent to the icrcuit in dynamic regime.
2. Calculate the voltage amplification.
3. Calculate the input impedance.