University of Badji Mokhtar Annaba
Faculty of technology
Department ST (2nd LMD) **TD n°4 (Electronique fondamentale 1)**
Fundamental electronics 1 (2025-2026)

EXERCISES ON BIPOLAR TRANSISTOR

Exercise 1

1-The current gain of the transistor β= 100, V_{BE}= 0.7volt and V_{CESat}= 0volt (saturation voltage). For R_B= 10 kΩ. Calculate the currents I_B , I_C and the voltage V_{CE}.

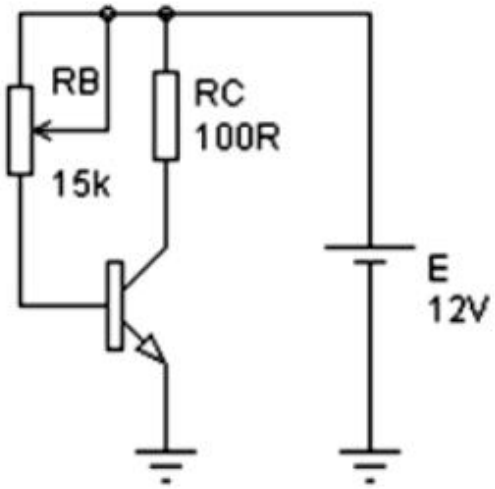
2-Calculate the minimum base current I_{Bmin} to saturate the transistor and the corresponding value of the resistor R_B.

The NPN transistor is replaced by a PNP transistor which has the same characteristics.

3-Draw a diagram of the set up.

4-What is the voltage V_{BE} between base and emitter.

5-Repeat question 1



Exercise 2

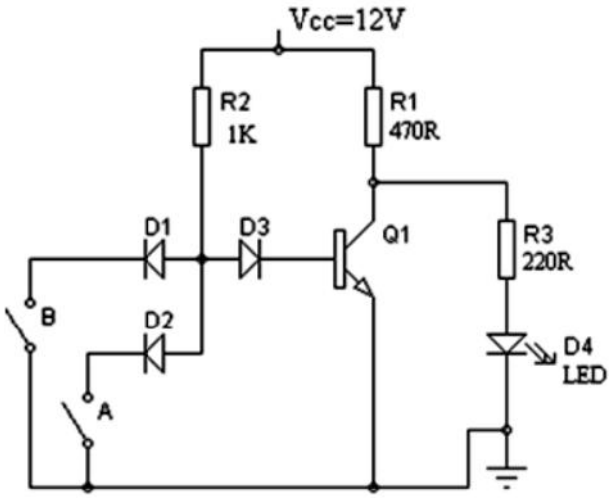
The switches A and B are open.

1- Calculate the current I_B.
2- What is the state of the transistor ?
3- Is the LED on or off ? Justify the answer.
4- Calculate the voltage V_{PC} the common point of the 3 diodes D1, D2 and D3.

We close the switch A (B is open)

5- Calculate the voltage V_{PC} and the current I_B. What is the state of the transistor ?
6- Calculate the current I flowing through R_1. What is the state of the LED ?
7- Calculate the voltage V_{CE}.
8- Complete the following table.

Switch B	Switch A	transistor State	LED State
open	open		
open	closed		
closed	open		
closed	closed		



β= 100
V_D= 0.6 volt
V_{BE}= 0.7 volt
V_{D4}=1.4 volt
V_{CESat}=0 volt

Exercise 3

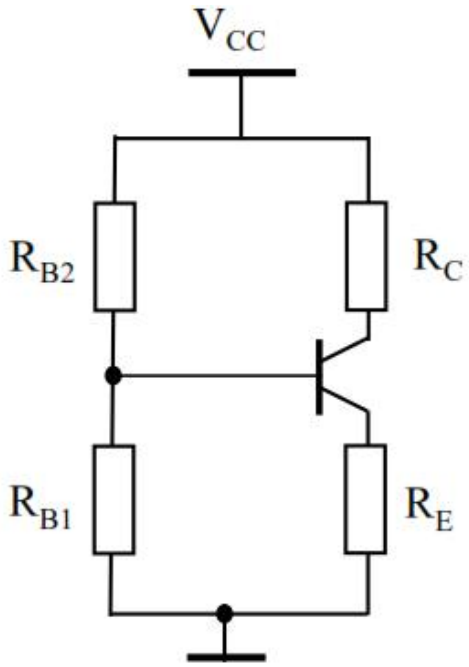
The figure below represents a biasing circuit from an NPN transistor using two base resistors.
Assume β = 100, V_{CC} = 12 volts, R_C = 5 kΩ, R_{B1} = 10 kΩ, and V_{BE0} = 0.7 volt.

1- We want to find an operating point (V_{CE0} = 5 Volts, I_{C0} = 1mA).

Calculate the values of resistors R_1 and R_2.
Plot the static load line and mark the operating point.

2- We keep the same resistor values as before and replace the transistor with one that has a β = 300.

Calculate the coordinates of the new operating point. Conclude.


V_{CC}
R_{B2}
R_C
R_{B1}
R_E