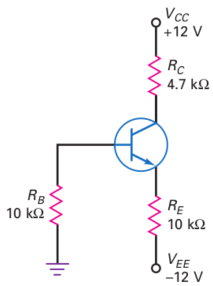
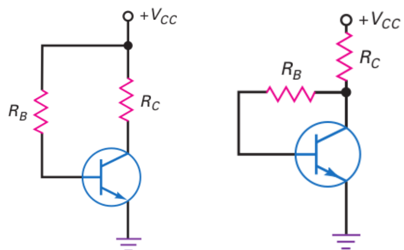
Transistor Tutorial Sheet

Q1. The figure above shows a biasing scheme with two power supplies with voltage



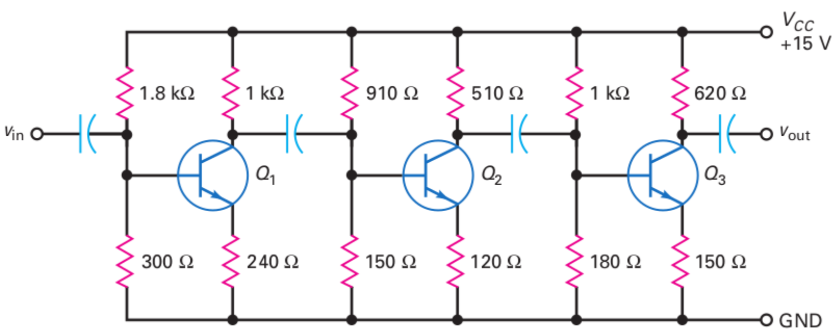
± 12 V. Calculate I_C and V_{CE} for the transistor.
Hint: There are two ways to approach this problem: (a) Assume that I_B is so very small that it can be set equal to zero, figure out V_B and solve the problem. (b) Assume that the transistor has $\beta_{\mathrm{dc}} = 100$, use Kirchhoff's Voltage law and solve the problem. Do the problem both ways and compare the answers.

Q2. In the above two circuits, take $R_B = 200\ k\Omega$ and $R_C = 1\ k\Omega$. For each circuit,

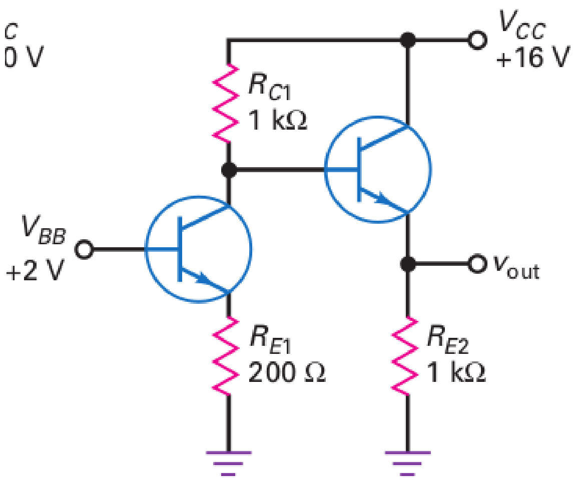


calculate I_C when (a) $\beta_{\mathrm{dc}} = 100$ and when (b) $\beta_{dc} = 300$. Why is I_C in the second circuit less sensitive to β_{dc} compared to the first circuit?

Q3. Calculate I_C and V_{CE} for each of the three transistors in the circuit.

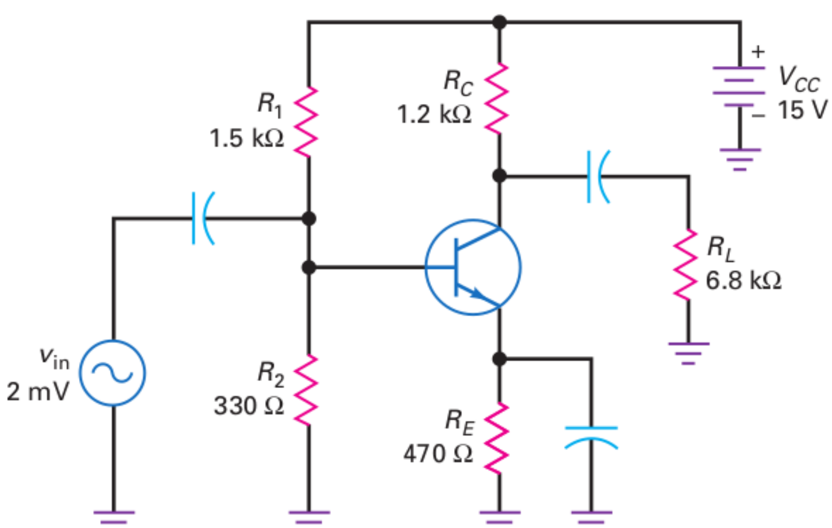


Q4. What is the voltage v_{out} in the above circuit?

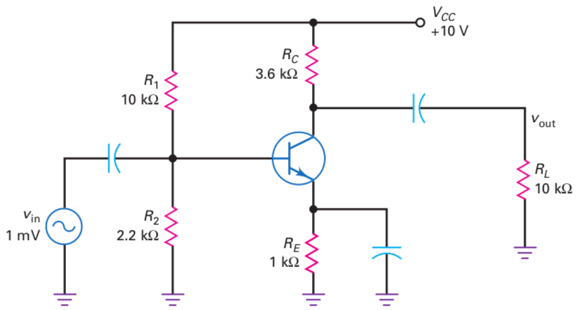


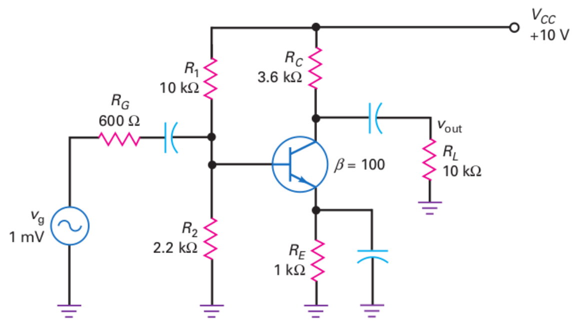
Note: The v_{out} in this problem is a DC voltage. So, the language in this problem violates the notation principle mentioned in class on 15th.

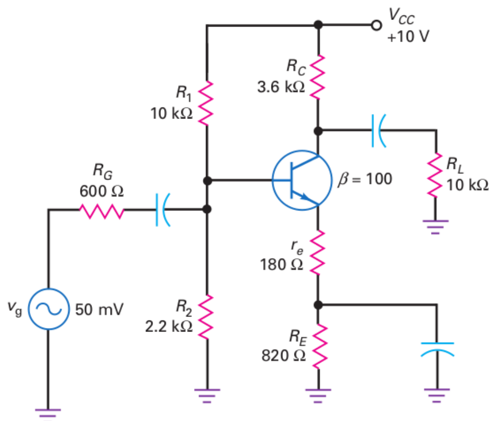
Q5. Calculate the AC voltage gain for the CE amplifier circuit given below.



Q6. The three circuits below have the same VDB and same R_L. But they have

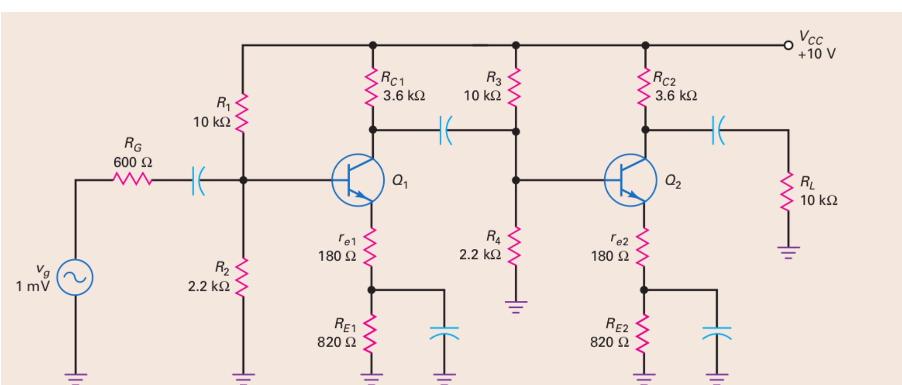






small differences. The first one is an idealized circuit, the second one has a source resistance R_G and in the third one, the emitter resistance is split into (180+820). Let v_{out} be the AC voltage across the load resistor R_L. Calculate the AC gain v_{out}/v_{in} for each of the circuits.

Q7. Calculate the net voltage gain v_{out}/v_{in} for the two-stage CE amplifier in the



above circuit. v_{out} is the voltage across the load resistor R_L.