**Nanyang Technological University**
**School of Electrical & Electronic Engineering**
**E2002 Analog Electronics – Tutorial 5**

1. Identify the region of operation for the following circuits. What is the $V_C$, $V_E$, $I_B$, $I_C$ and $I_E$ in each case. If active, what is the collector voltage? Assume $|V_{BE}| = 0.7$ V and $\beta = 100$.

   (Ans: (a) Saturation, $V_C = 1.4$ V, $V_E = 1.7$ V, $I_B = 0.29$ mA, $I_C = 0.14$ mA, $I_E = 0.43$ mA; (b) Active, $V_C = -13.68$ V, $V_E = -20.7$ V, $I_B = 18.4$ $\mu$A, $I_C = 1.86$ mA, $I_E = 1.86$ mA)

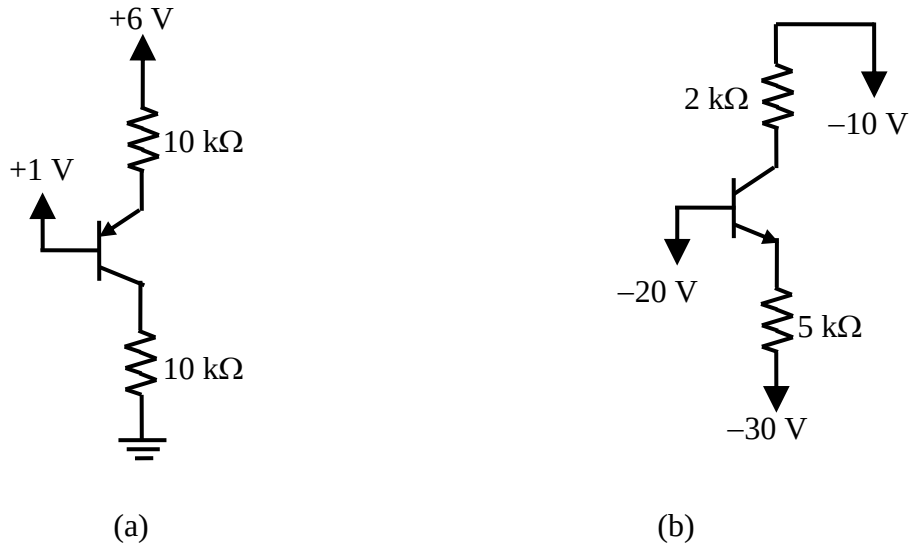


**Figure 1**

2. A common-emitter amplifier circuit is shown in Figure 2. Assume that the capacitors have infinite value, $\beta = 100$, $V_{CC} = V_{EE} = 15$ V, $R_I = 750$ Ω, $R_1 = R_2 = 200$ kΩ, $R_L = 100$ kΩ, $R_E = 280$ kΩ, and $R_C = 100$ kΩ. Calculate the DC operating point of the amplifier. (Ans: $I_C = 50$ $\mu A$, $V_{EC} = 10.86$ V).

   Calculate the dc power dissipation in each element in the amplifier circuit. Compare the result to the total power delivered by the sources.
   (Ans: $P_{R1} = 1.125$ mW, $P_{R2} = 1.125$ mW, $P_{Rc} = 0.25$ mW, $P_{RE} = 0.71$ mW, $P_{BJT} = 0.54$ mW. $P_S = 3.76$ mW)

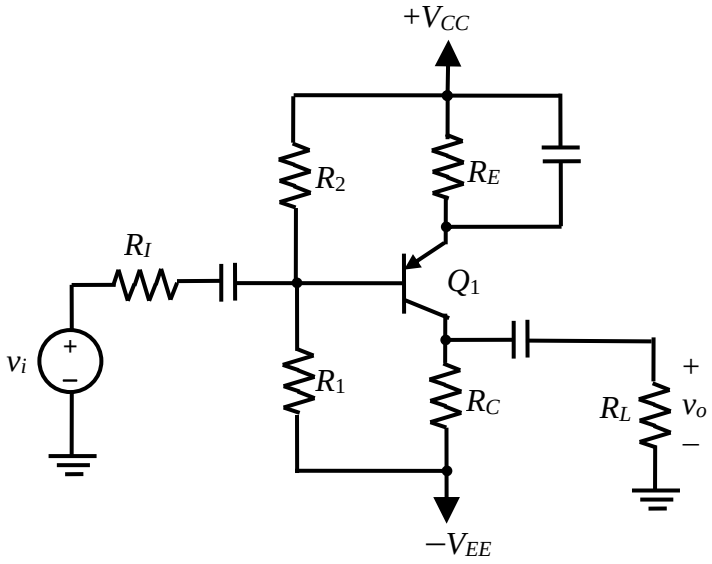


**Figure 2**