Answers to practical exercise of lecture - 2

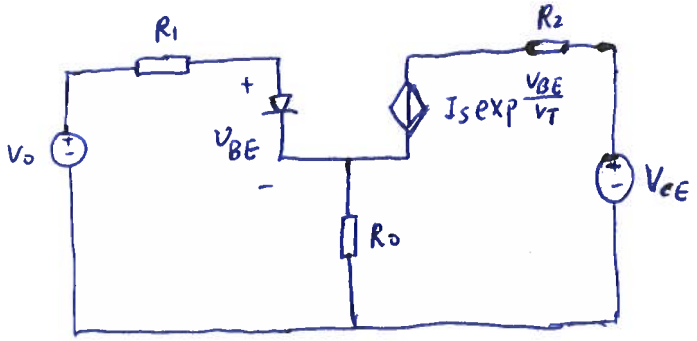
① $i_C = 1\,mA$, $I_S = 5 \times 10^{-16}\,A$, $V_T = 26\,mV$

$$i_C = I_S \exp \frac{V_{BE}}{V_T}$$

$$V_{BE} = 5 \times 778\,mV = 3.89\,V$$

$$i_b = \frac{i_C}{\beta} = \frac{1\,mA}{50} = 20\,\mu A$$

② Simple model:



③ $V_o = 5V$, $R_o = 100\Omega$, $V_{CE} = 12V$, $R_1 = 200\,\Omega$, $R_2 = 100\Omega$, $\beta = 50$, $I_S = 5 \times 10^{-16}\,A$

$$V_o = R_1 \cdot i_B + v_{BE} + R_o \cdot i_E = R_1 \cdot i_B + V_T \cdot \ln \frac{i_C}{I_S} + R_o \cdot i_E$$

$$= R_1 \cdot \frac{i_C}{\beta} + V_T \cdot \ln \frac{i_C}{I_S} + R_o \cdot i_C$$