8.1-2

(a)

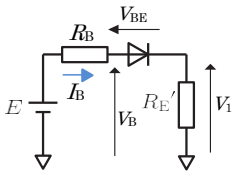
$$I_B = \frac{E - V_{BE}}{R_E' + R_B} = \frac{E - V_{BE}}{h_{FE}R_E + R_B}$$

$$V_1 = I_B R_E' = I_B h_{FE} R_E = \frac{h_{FE}R_E}{h_{FE}R_E + R_B}(E - V_{BE})$$

$R_B << h_{FE}R_E$より

$V_1 \approx E - V_{BE} = 4.3\mathrm{V}$

$V_B = V_1 + V_{BE} = 5\mathrm{V}$

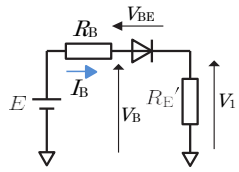


(b)

$$I_B = \frac{E - V_{BE}}{R_E' + R_B} = \frac{E - V_{BE}}{h_{FE}R_E + R_B}$$

$$V_2 = I_B h_{FE} R_E = \frac{h_{FE}R_E}{h_{FE}R_E + R_B}(E - V_{BE})$$

$V_2 = 2.15\mathrm{V}$



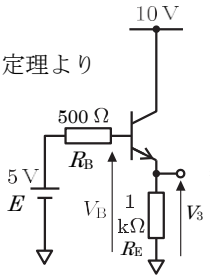
(c)

テブナンの定理より

$R_B << h_{FE}R_E$ より(a)と同様に考えることができる.

$V_B \fallingdotseq E = 5\mathrm{V}$

$V_3 = 4.3\mathrm{V}$



(d)

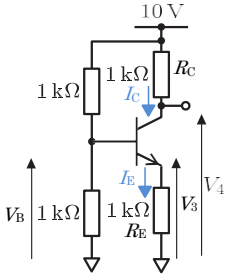
(c)より　$V_B = V_{CC}/2 \fallingdotseq 5\mathrm{V}$

$V_3 = V_B - V_{BE}$

$I_E = V_3/R_E$

$I_C \fallingdotseq I_E$

$V_4 = V_{CC} - R_C I_C = 5.7\mathrm{V}$



(2)

$I_E = V_E/R_E$

$V_E = I_E R_E \fallingdotseq I_C R_E = 1\mathrm{V}$

$V_B = V_E + V_{BE} = 1.7\mathrm{V}$

$R_2 << h_{FE}R_E$ のため，ベースの入力抵抗を無視する.

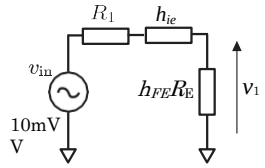
分圧の公式より

$V_B \fallingdotseq R_2 V_{CC}/(R_1 + R_2)$

$R_1 = R_2 V_{CC}/V_B - R_2 = 9\mathrm{k}\Omega$

8.1-4

(1)　R_1=1kΩ



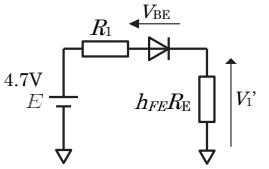
＜交流のみで考える＞

$$v_1 = \frac{h_{fe}R_E}{h_{fe}R_E + R_1 + h_{ie}} v_{in}$$

$h_{fe}R_E \gg R_1 + h_{ie}$より

$v_1 \approx v_{in} = 10mA$

＜直流のみで考える＞



$V_1' \fallingdotseq E - V_{BE} = 4V$

$V_1 = V_1' + v_1$

(2)

R_1=99kΩ

＜交流のみで考える＞

$$v_1 = \frac{h_{fe}R_E}{h_{fe}R_E + R_1 + h_{ie}} v_{in} = 5mA$$

＜直流のみで考える＞

$V_1' = (E - V_{BE})\, h_{FE}R_E / (h_{FE}R_E + R_1) \fallingdotseq 2V$

$V_1 = V_1' + v_1$

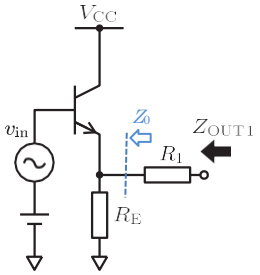
8.2-3

(1)

$Z_{OUT1}=Z_0+R_1= h_{ie}/h_{fe} //R_E+R_1$

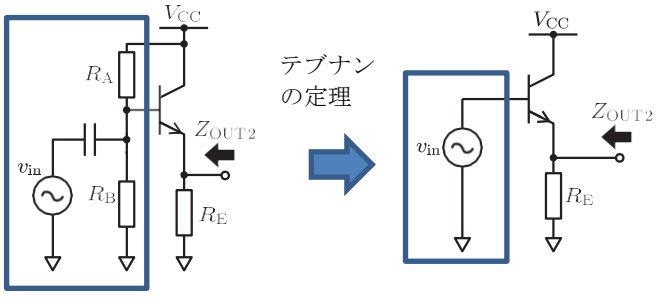
h_{ie}/h_{fe} <<R_Eより

$Z_{OUT1}= h_{ie}/h_{fe} +R_1$



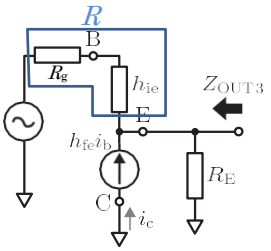
(2)

$Z_{OUT2}= h_{ie}/h_{fe} //R_E \fallingdotseq h_{ie}/h_{fe}$



(3)

$Z_{OUT3}= R/h_{fe} // R_E = (h_{ie}+R_g)/h_{fe} // R_E$



(4)

$R_2=R_g//R_A//R_B$

$Z_{OUT4}'= (R_2+h_{ie})/h_{fe} // R_E$

$Z_{OUT4}= Z_{OUT4}'+R_1$