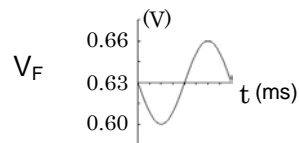


演習問題解答

1.2-2

$$V_1 = v + V_F$$

$$V_F = V_1 - v$$

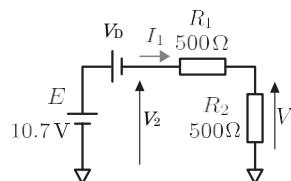


1.3-4

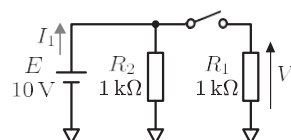
右の図は、等価回路である。

(1) $V_2 = E - V_D = 10V$

$$V_1 = \frac{R_2}{R_1 + R_2} V_2 = V_2 / 2 = 5V$$



(2) $I_1 = \frac{E}{R_2} = 10mA$

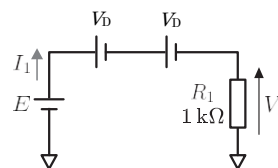


(3) 電流を流すには2つのダイオードに $2V_D$ 以上を加える必要がある。

$E > 2V_D$ より右図となる。

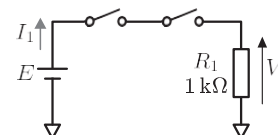
$$V_1 = E - V_D - V_D = 8.6V$$

$$I_1 = V_1 / R_1 = 8.6mA$$

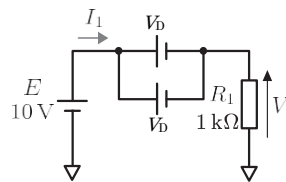


(4)

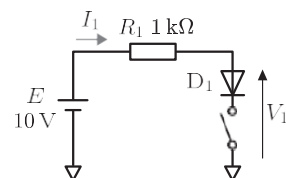
$E < 2V_D$ より右図となる。



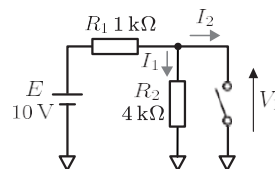
(5) $V_1 = E - V_D = 9.3V$
 $I_1 = V_1 / R_1 = 9.3mA$



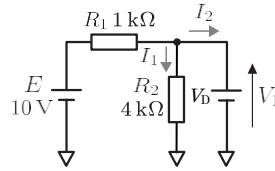
(6) $V_1 = E = 10V$
 $I_1 = 0A$



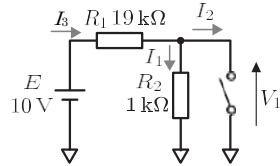
(7) $V_1 = \frac{R_2}{R_1 + R_2} E = 8V$



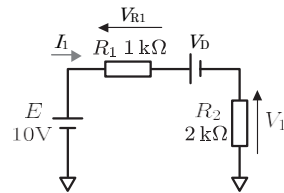
(8) $V_1 = V_D = 0.7\text{V}$
 $I_1 = V_1 / R_2 = 0.175\text{mA}$
 $I_3 = \frac{E - V_1}{R_1} = 9.3\text{mA}$
 $I_2 = I_3 - I_1 = 9.125\text{mA}$



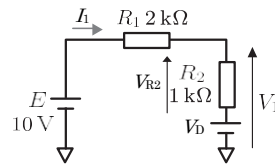
(9) $V_1 = \frac{R_2 E}{R_1 + R_2} = 0.5\text{V}$
 $I_1 = V_1 / R_2 = 0.5\text{mA}$
 $I_2 = 0\text{A}$



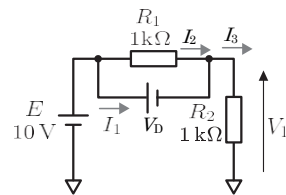
(10) $E = V_1 + V_D + V_{R1}$
 $E = I_1 R_2 + V_D + I_1 R_1$
 $I_1 = \frac{E - V_D}{R_1 + R_2} = 3.1\text{mA}$
 $V_1 = I_1 R_2 = 6.2\text{V}$



(11) $I_1 = \frac{E - V_D}{R_1 + R_2} = 3.1\text{mA}$
 $V_{R2} = I_1 R_2 = 3.1\text{V}$
 $V_1 = V_D + V_{R2} = 3.8\text{V}$



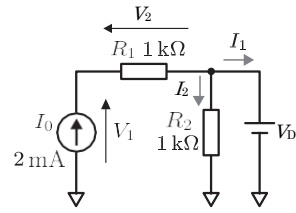
(12) $V_1 = E - V_D = 9.3\text{V}$
 $I_2 = \frac{V_D}{R_1} = 0.7\text{mA}$
 $I_3 = \frac{V_1}{R_2} = \frac{E - V_D}{R_2} = 9.3\text{mA}$
 $I_1 = I_3 - I_2 = 8.6\text{mA}$



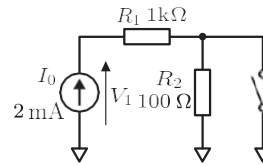
(13) $V_1 = V_D + V_2 = V_D + R_1 I_0 = 2.7\text{V}$

$$I_2 = \frac{V_D}{R_2} = 0.7\text{mA}$$

$$I_1 = I_0 - I_2 = 1.3\text{mA}$$



(14) $V_1 = I_0(R_1 + R_2) = 2.2\text{V}$



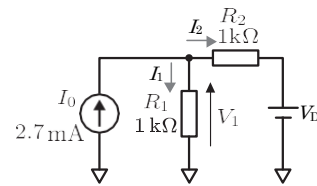
(15) キルヒホッフのノード解析を用いる

$$I_0 = I_1 + I_2$$

$$I_0 = \frac{V_1}{R_1} + \frac{V_1 - V_D}{R_2} \quad (1)$$

式(1)に値を入れて計算すると

$$V_1 = 1.7\text{V}$$



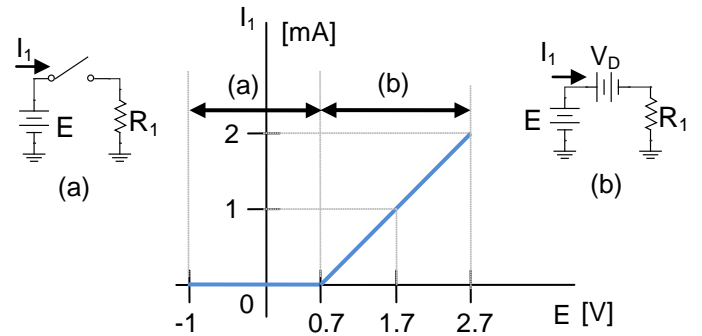
1.3-5

(1)ダイオードがスイッチ OFF と電圧源 V_D に置き換えた時をそれぞれ(a), (b)に示す。

(a)において, 電流 I_1 はゼロ

(b)において, 電流 I_1 は以下の式が成り立つ

$$I_1 = (E - V_D) / R_1$$

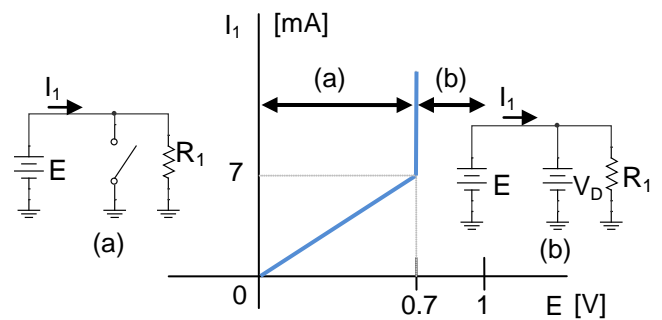


(2)

(a)において, 電流 I_1 は以下の式が成り立つ

$$I_1 = E / R_1$$

(b)において, 電流 I_1 は ∞



(3)

(a)において, 電流 I_1 は以下の式が成り立つ

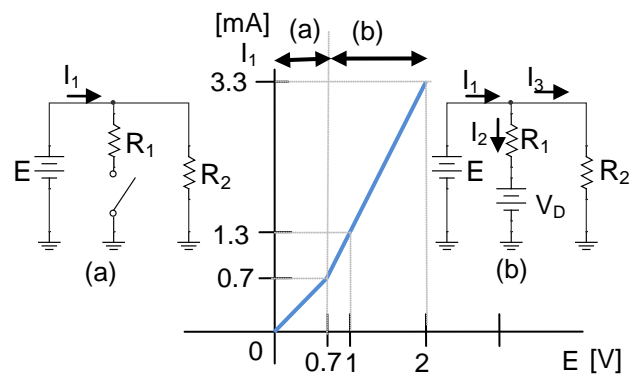
$$I_1 = E / R_2$$

(b)において, 各電流 $I_1 \sim I_3$ は以下の式が成り立つ

$$I_2 = (E - V_D) / R_1$$

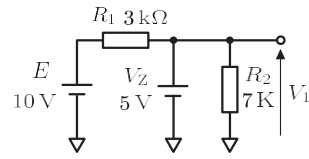
$$I_3 = E / R_2$$

$$I_1 = I_2 + I_3$$

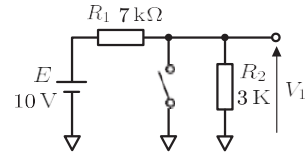


1.5-4

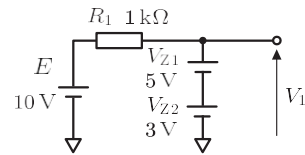
(1) $V_1 = V_Z = 5V$



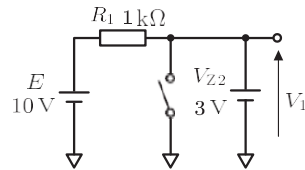
(2) $V_1 = R_2 E / (R_2 + R_1) = 3V$



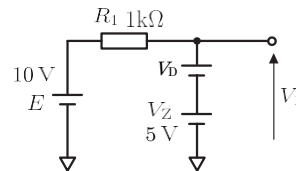
(3) $V_1 = V_{Z1} + V_{Z2} = 8V$



(4) $V_1 = V_{Z2} = 3V$



(5) $V_1 = V_D + V_{Z2} = 5.7V$



(6) $I_1 = (E - V_Z) / (R_1 + R_2) = 2.5mA$

$V_1 = V_Z + R_2 I_1 = 7.5V$

