

平成 1 1 年度 有明工業高等専門学校 (編入学試験)
電子情報工学科 (90 分) 解答

A 電気基礎

問 1. (1) R_2, R_3 の合成抵抗 R_4 は

$$R_4 = \frac{R_2 R_3}{R_2 + R_3} = \frac{60 \times 40}{60 + 40} = 24 [\Omega]$$

全合成抵抗 R は

$$R = R_1 + R_4 = 16 + 24 = 40 [\Omega]$$

全電流 I は

$$I = \frac{V}{R} = \frac{200}{40} = 5 [\text{A}]$$

従って, R_2 を流れる電流 I_2 は

$$I_2 = I_1 \times \frac{R_3}{R_2 + R_3} = 5 \times \frac{40}{60 + 40} = 2 [\text{A}]$$

$$(2) P = I_2^2 R_2 = 2^2 \times 60 = 2400 [\text{W}] = 2.4 [\text{KW}]$$

問 2. (1) $W = \frac{1}{2} C V^2 = \frac{1}{2} \times 500 \times 10^{-6} \times 100^2 = 2.5 [\text{J}]$

$$(2) \frac{100}{R} = 0.5 \times 10^{-3} \quad \text{より} \quad R = 200 [\text{K}\Omega]$$

$$t = C R = 200 \times 10^3 \times 500 \times 10^{-6} = 100 [\text{s}]$$

問 3. $e = B \ell v \sin \theta = 0.3 \times 0.5 \times 20 \times \sin 60^\circ = 2.60 [\text{V}]$

問 4.

$$Z_a = \frac{Z_a Z_b}{Z_a + Z_b} + \frac{Z_a Z_c}{Z_a + Z_c}$$

$$1 = \frac{Z_b}{Z_a + Z_b} + \frac{Z_c}{Z_a + Z_c}$$

$$(Z_a + Z_b)(Z_a + Z_c) = Z_b(Z_a + Z_c) + Z_c(Z_a + Z_b)$$

$$Z_a^2 = Z_b Z_c$$

問 5. インピーダンス

$$\begin{aligned}
 Z &= \sqrt{R^2 + (\omega L)^2} \\
 &= \sqrt{31.4^2 + (2\pi \times 50 \times 100 \times 10^{-3})^2} \\
 &= \sqrt{31.4^2 + 31.4^2} = 44.4
 \end{aligned}$$

電流

$$I = \frac{V}{Z} = \frac{200}{44.4} = 4.5 \text{ [A]}$$

B 電子技術

問 1. (1) h, e

(2) l, a

(3) k, g

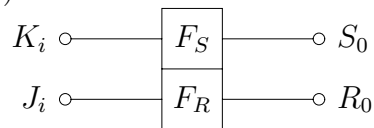
問 2. (1) $I_L = \frac{V}{R_L} = \frac{5.7 - 0.7}{5} = 1 \text{ [A]}$ (2) $P_C = I_C \times V_{CE} = 1 \times (12 - 5.7) = 6.3 \text{ [W]}$ (3) $I_R = \frac{V_{CE}}{R_R} = \frac{E - V_{ZD}}{R_R} = \frac{12 - 5.7}{0.5 \times 10^3} = 0.0126 \text{ [A]}$ 問 3. (1) $v_0 = A_0(v_i - v_f) = A_0(v_i - \beta v_0)$ から

$$v_0 = \frac{A_0 v_i}{1 + A_0 \beta}$$

従って ,

$$A = \frac{v_0}{v_i} = \frac{A_0}{1 + A_0 \beta}$$

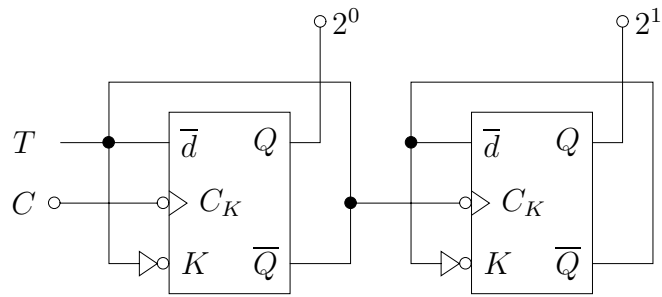
問 4. (1) (a)



(b)

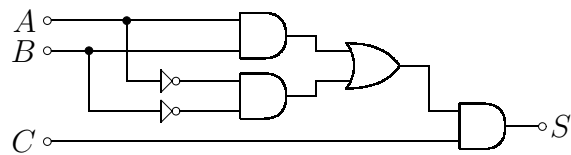
入力		出力	
$\bar{d}_i^n$	K_i^n	R_0^{n+1}	S_0^{n+1}
0	0	R_0^{n+1}	S_0^n
0	1	0	1
1	0	1	0
1	1	$\bar{R}_0^n$	$\bar{S}_0^n$

(2)



(3)

$$\begin{aligned}
 S &= \overline{(\bar{A} \cdot B + A \cdot \bar{B})} \cdot C \\
 &= \overline{\bar{A} \cdot B} \cdot \overline{A \cdot \bar{B}} \cdot C \\
 &= (\bar{\bar{A}} + \bar{B}) \cdot (\bar{A} + \bar{\bar{B}}) \cdot C \\
 &= (A + \bar{B}) \cdot (\bar{A} + B) \cdot C \\
 &= (A\bar{A} + AB + \bar{A}\bar{B} + B\bar{B}) \cdot C \\
 &= (AB + \bar{A}\bar{B}) \cdot C
 \end{aligned}$$



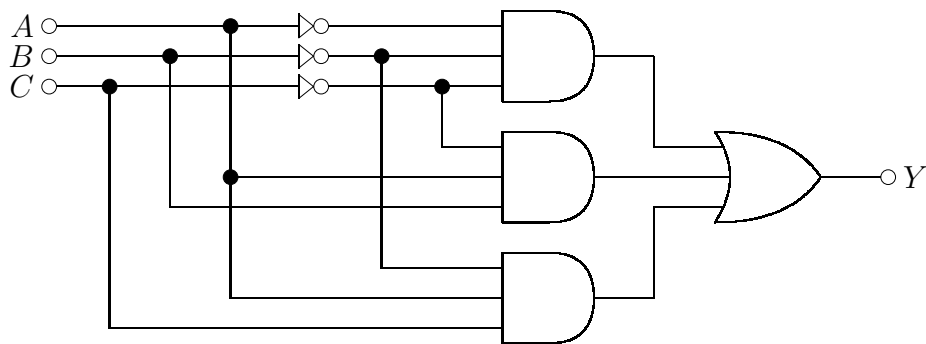
C 情報技術

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①	ハ	②	イ	③	テ	④	セ	⑤	ヌ
⑥	ク	⑦	ス	⑧	ツ	⑨	ケ	⑩	タ
⑪	コ	⑫	ネ	⑬	カ				

2 (1) $Y = \overline{A}\overline{B}\overline{C} + AB\overline{C} + A\overline{B}C$

(2)



3 (1) $(1F4)_{16} = (500)_{10}$

$(10100110)_2 = (A6)_{16}$

$(100)_{10} = (1100100)_2$

(2) $(1011011)_2 + (239)_{10} = (330)_{10}$

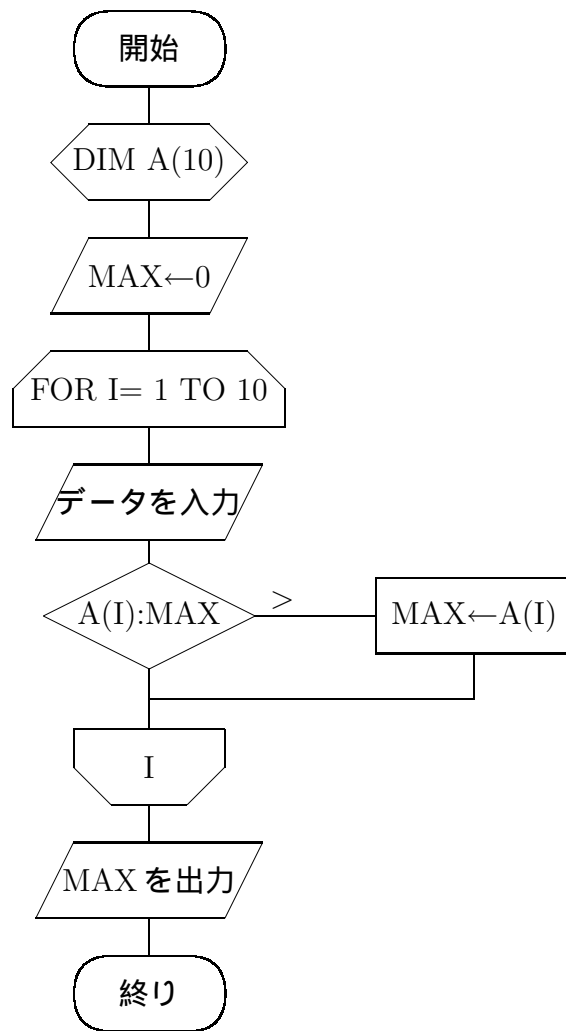
$(135)_{10} + (135)_{16} = (1BC)_{16}$

$(AB)_{16} - (1011001)_2 = (82)_{10}$

$(678)_{10} + (4B5)_{16} = (1101011011)_2$

$(1111)_2 \times (1111)_{16} = (65535)_{10}$

$(100)_2 + (100)_{10} + (100)_{16} = (168)_{16}$

4 流れを表す図**ソースプログラム**

```
10 DIM A(10)
20 MAX=0
30 FOR I=1 TO 10
40 INPUT A(I)
50 IF A(I)>MAX THEN MAX=A(I)
60 NEXT I
70 PRINT MAX
80 END
```