

681.325

ΚΟΜΠΪΥΤΕΡΗΑ ΣΧΕΜΟΤΕΧΝΙΚΑ

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13.1.	337			
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1.1.

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0 1,

0 1

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1.2.

[17].

{

$$= \{X_1, X_2, \dots, X, \dots, X_n\}. \tag{1.1}$$

$$= \{X/X \quad Q\} \tag{1.2}$$

$$= \phi. \quad = \{ \phi \} \quad (\phi$$

{\phi}).

$$\mu_A(x),$$

$$\mu_A(x) = \begin{cases} 1, & \in ; \\ 0, & \notin . \end{cases} \tag{1.3}$$

" " ; (), " " .

$$\forall x [x \in X \rightarrow x \in Y], \quad \subseteq Y. \tag{1.4}$$

$$\emptyset \subseteq .$$

$$()$$

" [17].

$$(\mu_A = 1),$$

$$(0 < \mu_A < 1)$$

$$(\mu_A = 0).$$

[0, 1].

$$A = \{(x_1 | 0,1), (x_2 | 0), (x_3 | 0,5), (x_4 | 1), (x_5 | 0,8)\}, \tag{1.5}$$

$$A \subset \subseteq . \tag{1.6}$$

$$\in_{0,2}, \in_1, z \in_0 A. \tag{1.7}$$

$$\in_1$$

$$\in,$$

$$\in_0$$

$$\notin.$$

[41, 42].

$$\{(x | \mu_A(x))\}, \forall x \in E, \tag{1.8}$$

$$\mu_A(x) - \underline{A} \cdot \mu_A(x) = \{0, 1\}$$

$$x \xrightarrow{\mu_A} M, \tag{1.9}$$

1.3.

$$x \cap E = x; \tag{1.10}$$

$$x \cup E = E \tag{1.11}$$

$$X \cup Y = \{a | a \in X \vee a \in Y\}; X \cup \emptyset = X. \tag{1.12}$$

$$X \cap Y = \{a | a \in X \wedge a \in Y\}. \tag{1.13}$$

$$(\overline{\overline{X}}) = X = \{x | x \in \overline{\overline{X}} \iff x \notin \overline{X}\}. \tag{1.14}$$

$$X \setminus Y = \{x | x \in X \wedge x \notin Y\}. \tag{1.15}$$

$$\underline{A} \subseteq \underline{B}, \forall x \in E : \mu_B(x) \tag{1.16}$$

$$\underline{A} \subset \underline{B} \iff \underline{A} \subseteq \underline{B} \wedge \underline{A} \neq \underline{B} \tag{1.17}$$

$$\underline{A} \subset \underline{B} \iff \underline{A} \subseteq \underline{B} \wedge \underline{A} \neq \underline{B} \tag{1.18}$$

$$\underline{A} \dot{\subseteq} \underline{B} : \forall x \in E : \mu_A(x) = \mu_B(x) \tag{1.19}$$

$$\underline{A} = \underline{B} \tag{1.20}$$

$$\underline{A} \neq \underline{B} \tag{1.21}$$

$$\forall x \in E : \mu_{\underline{B}}(x) = 1 - \mu_{\underline{A}}(x). \tag{1.22}$$

$$\overline{\overline{\underline{B}}} = \underline{B} \tag{1.23}$$

$$\overline{(\overline{\underline{A}})} = \underline{A} \tag{1.24}$$

$$= [0, 1].$$

$$\underline{A} \dot{\subseteq} \underline{B}$$

$$\underline{A} \dot{\subseteq} \underline{B} :$$

$$\forall x \in E : \mu_{\underline{A} \cap \underline{B}}(x) = \min(\mu_{\underline{A}}(x), \mu_{\underline{B}}(x)). \quad (1.25)$$

$$\underline{A} \cap \underline{B} \quad (1.26)$$

$$(1.25) \quad (1.26),$$

$$\forall x \in E : x \in \underline{A} \cap \underline{B} \Rightarrow x \in \underline{A} \cap \underline{B}. \quad (1.27)$$

$$\forall x \in E : \mu_{\underline{A} \cup \underline{B}}(x) = \max(\mu_{\underline{A}}(x), \mu_{\underline{B}}(x)). \quad (1.28)$$

$$\underline{A} \cup \underline{B} \quad (1.29)$$

$$(1.28) \quad (1.29),$$

$$\forall x \in E : x \in \underline{A} \cup \underline{B} \Rightarrow x \in \underline{A} \cup \underline{B}. \quad (1.30)$$

$$\underline{A} \oplus \underline{B} = (\underline{A} \cap \underline{\bar{B}}) \cup (\underline{\bar{A}} \cap \underline{B}). \quad (1.31)$$

$$\underline{A} - \underline{B} = \underline{A} \cap \underline{\bar{B}} \quad (1.32)$$

$$\underline{A} - \underline{B} \neq \underline{\bar{B}} - \underline{A}. \quad (1.33)$$

() [17].

N-

$$, = \{a_1, a_2, \dots, a_n\}.$$

Y-

$$Z = \{(x, y) | x \in X, y \in Y\} \quad (1.34)$$

$$Z = X * Y. \quad Z$$

$$X * Y \neq Y * X. \quad (1.35)$$

$$X * Y \neq Y * X.$$

1, 2, ...

$$1^* 2^* \dots^*$$

1, - 2

$$M^s = \underbrace{* \dots *}_s, \quad (1.36)$$

S = 2, 3, ...

$$W = \{$$

1, 2, ... }

1) -

W

$$\forall x \in W [X \subseteq M]; \quad (1.37)$$

2) -

Y W

$$\forall x, y \in W [X \neq Y \rightarrow X \cap Y = \emptyset]; \quad (1.38)$$

3) ,

$$\bigcup_{x \in W} x = M. \quad (1.39)$$

1.4.

$$\begin{aligned}
 & \text{Let } q = (X, Y, Q), \quad Q \subseteq X * Y \\
 & \text{where } X, Y \text{ are sets, } Q \text{ is a relation on } X \times Y.
 \end{aligned}
 \tag{1.40}$$

$$\begin{aligned}
 & \text{The inverse relation } q^{-1} = (Y, X, Q^{-1}), \\
 & \text{where } Q^{-1} \subseteq Y * X.
 \end{aligned}
 \tag{1.41}$$

$$(q^{-1})^{-1} = q.
 \tag{1.42}$$

$$\begin{aligned}
 & \text{Let } X, Y, Z \text{ be sets, } q = (X, Y, Q), Q \subseteq X * Y; \\
 & p = (Y, Z, P), P \subseteq Y * Z.
 \end{aligned}
 \tag{1.43}$$

$$\begin{aligned}
 & \text{The composition } q \circ p = (X, Z, Q \circ P), \\
 & \text{where } Q \circ P \subseteq X * Z.
 \end{aligned}
 \tag{1.44}$$

$$\begin{aligned}
 & \text{Let } x \in X, y \in Y, (x, y) \in Q, \\
 & \text{then } (x, y) \in Q \subseteq X * Y.
 \end{aligned}
 \tag{1.45}$$

$$\begin{aligned}
 & \text{Let } x \in X, \\
 & \text{then } (x, y) \in Q \subseteq Y,
 \end{aligned}
 \tag{1.46}$$

$$\begin{aligned}
 & \text{Let } \varphi \subseteq A * B, \\
 & \text{then } \varphi : X \rightarrow Y; X \xrightarrow{\varphi} Y; \varphi(x); y = \varphi(x).
 \end{aligned}
 \tag{1.47}$$

$$\begin{aligned}
 & \text{Let } \varphi : X \rightarrow Y, \\
 & \text{then } (x, y) \in \varphi, \quad x \in A, \quad (x, y) \in A * Y, \\
 & \varphi_A = \varphi \cap (A * Y).
 \end{aligned}
 \tag{1.48}$$

$$\text{1.} \tag{1.49}$$

2. $x \equiv x$;
3. $x \equiv y \rightarrow y \equiv x$;
4. $x \equiv y \rightarrow x = y$;
5. $x \equiv y, y \equiv z \rightarrow x \equiv z$;
6. $x \equiv y, y \equiv z \rightarrow x \equiv z$.

$$\begin{cases} x < x & (\text{---}); \\ x < y, y < x & (\text{---}); \\ x < y, y < z \rightarrow x < z & (\text{---}). \end{cases} \quad (1.52)$$

1. $x \equiv x$;
 2. $x \equiv y \rightarrow y \equiv x$;
 3. $x \equiv y, y \equiv z \rightarrow x \equiv z$.
- \equiv (\sim).

$$\begin{cases} x \equiv x & (\text{---}); \\ x \equiv y \rightarrow y \equiv x & (\text{---}); \\ x \equiv y, y \equiv z \rightarrow x \equiv z & (\text{---}). \end{cases} \quad (1.50)$$

\equiv ,
 A_j .

\leq ,
 $<$.

$$\begin{cases} x \leq x & (\text{---}); \\ x \leq y, y \leq x \rightarrow = & (\text{---}); \\ x \leq y, y \leq z \rightarrow x \leq z & (\text{---}). \end{cases} \quad (1.51)$$

1. $x >> x$ (---);
2. $x >> y, y >> x$ (---).

1.5.

$A, B, C \in E$.

$$A \cap B = B \cap A; \quad (1.53)$$

$$A \cup B = B \cup A. \quad (1.54)$$

$$(A \cap B) \cap C = A \cap (B \cap C); \quad (1.55)$$

$$(A \cup B) \cup C = A \cup (B \cup C). \quad (1.56)$$

$$A \cap A = A; \quad (1.57)$$

$$A \cup A = A. \quad (1.58)$$

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C); \quad (1.59)$$

$$A \cup (B \cap C) = (A \cup B) \cap (A \cup C); \quad (1.60)$$

$$A \cap \bar{A} = \emptyset; \quad (1.61)$$

$$A \cup \bar{A} = E; \quad (1.62)$$

$$A \cap \emptyset = \emptyset; \quad (1.63)$$

$$A \cup \emptyset = A; \quad (1.64)$$

$$A \cap E = A; \quad (1.65)$$

$$A \cup E = E. \quad (1.66)$$

$$\overline{\overline{A}} = A. \quad (1.67)$$

$$\overline{A \cap B} = \overline{A} \cup \overline{B}; \quad (1.68)$$

$$\overline{A \cup B} = \overline{A} \cap \overline{B}; \quad (1.69)$$

$\underline{A}, \underline{B}, \underline{C}$

$$\underline{A} \cap \underline{B} = \underline{B} \cap \underline{A}; \quad (1.70)$$

$$\underline{A} \cup \underline{B} = \underline{B} \cup \underline{A}. \quad (1.71)$$

$$(\underline{A} \cap \underline{B}) \cap \underline{C} = \underline{A} \cap (\underline{B} \cap \underline{C}); \quad (1.72)$$

$$(\underline{A} \cup \underline{B}) \cup \underline{C} = \underline{A} \cup (\underline{B} \cup \underline{C}); \quad (1.73)$$

$$\underline{A} \cap \underline{A} = \underline{A}; \quad (1.74)$$

$$\underline{A} \cup \underline{A} = \underline{A}; \quad (1.75)$$

$$\underline{A} \cap (\underline{B} \cup \underline{C}) = (\underline{A} \cap \underline{B}) \cup (\underline{A} \cap \underline{C}); \quad (1.76)$$

$$\underline{A} \cup (\underline{B} \cap \underline{C}) = (\underline{A} \cup \underline{B}) \cap (\underline{A} \cup \underline{C}); \quad (1.77)$$

$$\underline{A} \cup \underline{A} = \underline{A}, \quad \forall x_i \in E: \mu_0(x_i) = \emptyset; \quad (1.78)$$

$$\underline{A} \cup E = \underline{A}, \quad \forall x_i \in E: \mu_0(x_i) = 1. \quad (1.79)$$

$$\underline{A} \cup E = E. \quad (1.80)$$

$$\overline{\overline{A}} = A. \quad (1.81)$$

$$\overline{\underline{A} \cap \underline{B}} = \overline{\underline{A}} \cup \overline{\underline{B}} \quad (1.82)$$

$$\overline{\underline{A} \cup \underline{B}} = \overline{\underline{A}} \cap \overline{\underline{B}} \quad (1.83)$$

, (1.61) (1.62).

1.6.

1. ?
2. ?
3. ?
4. ?
5. ?
6. ?
7. ?
8. $= \{ \emptyset \},$?
9. ?
10. $\mu_A(x)?$
11. ?
12. ?
13. ?
14. ?
15. ?
16. ?
17. $Y?$
18. $\underline{A} \text{ i } \underline{B}$?
19. $\underline{A} \underline{B}$?
20. $\underline{A} \underline{B}$?
21. $\underline{A} \underline{B}$?
22. N- ?
23. $W = \{ 1, 2, \dots \}$
24. $q?$

25. ?
26. ?
27. ?
28. ?
29. .
30. ” ”?
31. ?
32. ?
33. ?
34. ?
35. ?
36. ?
37. $\underline{A}, \underline{B} \underline{C}$

2.

2.1.

(), (), (t)

2.2.

$f(x_1, x_2, \dots, x_n)$
 x_1, x_2, \dots, x_n
 2^n
 2^{2^n}
 256
 2^n
 (. 2.1. 2.2.)

2.1.

	0	1		
$f_0(x)$	0	0	0	0
$f_1(x)$	0	1	x	
$f_2(x)$	1	0	\bar{x}	
$f_3(x)$	1	1	1	1

2.2.

x	0	0	1	1							
y	0	1	0	1	A	B	C	D	E		
f_0	0	0	0	0	*			*	*	0	0
f_1	0	0	0	1	*	*		*		$xy, x\Delta y, x \& y$,
f_2	0	0	1	0	*					$x\Delta y$	
f_3	0	0	1	1	*	*	*	*	*		
f_4	0	1	0	0	*					$y\Delta x$	
f_5	0	1	0	1	*	*	*	*	*		
f_6	0	1	1	0	*				*	$x \oplus y$	
f_7	0	1	1	1	*	*		*		$x\forall y, x+y$,
f_8	1	0	0	0						$x \cdot y$	
f_9	1	0	0	1		*			*	\sim	
f_{10}	1	0	1	0			*		*	\bar{y}	
f_{11}	1	0	1	1		*				$y \cdot x$	
f_{12}	1	1	0	0			*		*	\bar{x}	
f_{13}	1	1	0	1		*					
f_{14}	1	1	1	0						$ y$	
f_{15}	1	1	1	1		*		*	*	1	1

$f(a, b) = a \vee b \quad b = c \vee d, \quad f(a, b, c) = a \vee c \vee d.$

() ,

1 - n , 1
 $f_i(x, y, z),$
 1 7 (.2.3).

2.3.

x									
y									
z									
$f_1(x, z)$									
$f_2(x, z)$									
$f_3(x, z)$									

2.3 $f_i(x, y, z) = (0, 0, 0, 0, 0, 1, 1, 1)$ 7,

$111_{(2)} = 7_{(10)}$.

1. , n

n-

1. , 0, .
 $f_i(x, y, z) \quad 5 (1, 0, 1) \quad 1.$

$\bar{x}\bar{y}z.$ n

2^n 1.

1, 1

()

$f_1(x, y, z) = \bar{x} \vee y \vee \bar{z}$.
 $f_{23}(x, y, z) = \bar{x}yz \vee x\bar{y}z \vee xy\bar{z} \vee xyz$.
 $f_{23}(x, y, z) = (x \vee y \vee z)(x \vee y \vee \bar{z})(x \vee \bar{y} \vee z)(\bar{x} \vee y \vee z)$.

$f(x, y, z) = x \vee \bar{x}yz$ $f(a, b, c) = ab \vee \bar{a}bc$.
 $f(a, b, c) = \bar{a}b \vee abc$; $f(x, y, z) = (\bar{x} \vee y \vee z)(x \vee \bar{y} \vee z)$.

$f_{23}(x, y, z) = (3 \vee 5 \vee 6 \vee 7) = \vee(3, 5, 6, 7)$;
 $f_{23}(x, y, z) = (0 \wedge 1 \wedge 2 \wedge 4) = \wedge(0, 1, 2, 4)$.

$f_i(a, b, c, d, \dots, z)$
 (. 1.1, 1.2).

$n=2, 2.2, 2.3$.

$n=2$	y	\bar{y}
x	xy	$x\bar{y}$
\bar{x}	$\bar{x}y$	$\bar{x}\bar{y}$

. 2.1.

$n=3$	y		\bar{y}	
x	$xy\bar{z}$	xyz	$x\bar{y}z$	$x\bar{y}\bar{z}$
\bar{x}	$\bar{x}y\bar{z}$	$\bar{x}yz$	$\bar{x}\bar{y}z$	$\bar{x}\bar{y}\bar{z}$
	\bar{z}	z	\bar{z}	

. 2.2.

$n=4$	b		\bar{b}		
a	$ab\bar{c}\bar{d}$	$ab\bar{c}d$	$a\bar{b}\bar{c}\bar{d}$	$a\bar{b}c\bar{d}$	\bar{c}
	$abc\bar{d}$	$abcd$	$\bar{a}\bar{b}\bar{c}\bar{d}$	$\bar{a}\bar{b}c\bar{d}$	
\bar{a}	$\bar{a}b\bar{c}\bar{d}$	$\bar{a}b\bar{c}d$	$\bar{a}\bar{b}\bar{c}\bar{d}$	$\bar{a}\bar{b}c\bar{d}$	c
	$\bar{a}b\bar{c}d$	$\bar{a}bc\bar{d}$	$\bar{a}\bar{b}c\bar{d}$	$\bar{a}b\bar{c}\bar{d}$	
	\bar{d}	d		\bar{d}	

. 2.3.

$n=3$	y		\bar{y}	
f_{23}				
x	1	1	1	0
\bar{x}	0	1	0	0
	\bar{z}	z	\bar{z}	

. 2.4.

1 0,

$$f_{23}(x, y, z) = xy\bar{z} \vee x\bar{y}z \vee \bar{x}yz \vee xyz. \quad (2.4)$$

0, , 1,

$n \leq 10,$

n

()

2.3.

$$a \vee 0 = a; a \wedge 1 = a; \quad (2.1)$$

$$a \vee 1 = 1; a \wedge 0 = 0; \quad (2.2)$$

$$: a \vee b = b \vee a; \quad (2.3)$$

$$: (a \vee b) \vee c = a \vee (b \vee c); (a \wedge b) \wedge c = a \wedge (b \wedge c); \quad (2.4)$$

$$: a \wedge (b \vee c) = a \wedge b \vee a \wedge c; a \vee b \wedge c = (a \vee b) \wedge (a \vee c); \quad (2.5)$$

$$: a \vee a = a; a \wedge a = a; \quad (2.6)$$

$$: a \vee a \wedge b = a; a \wedge (a \vee b) = a; \quad (2.7)$$

$$: a \wedge b \vee a \wedge \bar{b} = a; (a \vee b) \wedge (a \vee \bar{b}) = a; \quad (2.8)$$

$$: \overline{a \vee b} = \bar{a} \wedge \bar{b}; \overline{a \wedge b} = \bar{a} \vee \bar{b}; \quad (2.9)$$

$$a \vee \bar{a} = 1; a \wedge \bar{a} = 0; \quad (2.10)$$

$$\bar{0} = 1; \bar{1} = 0; \quad (2.11)$$

$$\bar{a} = a. \quad (2.12)$$

$$f_8(x, y) = x \downarrow y = \overline{x \vee y},$$

$$: f_{14}(x, y) = x | y = \overline{x \wedge y}$$

1.

2.4.

().

(2.7):

$$xy \vee x \bar{y} = x \vee xy \vee x \bar{y} \quad (2.13)$$

$$x \vee xy = x.$$

1

$$x = x \wedge 1 = x(y \vee \bar{y}) = xy \vee x\bar{y}. \quad (2.14)$$

$$f(a,b,c,d) = a\bar{c}\bar{d} \vee \bar{a}\bar{b}\bar{c}\bar{d} \vee \bar{a}\bar{b}\bar{c} \vee \bar{a}\bar{b}\bar{c}d.$$

$$a\bar{c}\bar{d} \quad (b \vee \bar{b}) \quad \bar{a}\bar{b}\bar{c} \quad (d \vee \bar{d}).$$

$$f(a,b,c,d) = \underset{1}{a\bar{c}\bar{d}} \vee \underset{2}{\bar{a}\bar{b}\bar{c}\bar{d}} \vee \underset{3}{\bar{a}\bar{b}\bar{c}\bar{d}} \vee \underset{4}{\bar{a}\bar{b}\bar{c}d} \vee \underset{5}{\bar{a}\bar{b}\bar{c}\bar{d}} \vee \underset{6}{\bar{a}\bar{b}\bar{c}d}$$

1-2, 1-5, 2-3, 2-6, 3-5,4-5

$$f(a,b,c,d) = a\bar{c}\bar{d} \vee \bar{b}\bar{c}\bar{d} \vee \bar{b}\bar{c}\bar{d} \vee \bar{a}\bar{b}\bar{c} \vee \bar{a}\bar{c}\bar{d} \vee \bar{a}\bar{b}\bar{c}.$$

$$: f(a,b,c,d) = \bar{c}\bar{d} \vee \bar{a}\bar{b}\bar{c} \vee \bar{a}\bar{b}\bar{c}.$$

$\bar{c}\bar{d}$,

1.

(. 2.4),

*

$$f(x,y,z) = \underset{1}{\bar{x}\bar{y}z} \vee \underset{2}{\bar{x}\bar{y}\bar{z}} \vee \underset{3}{abc} \vee \underset{4}{x\bar{y}\bar{z}} \vee \underset{5}{x\bar{y}z} \vee \underset{6}{\bar{x}\bar{y}\bar{z}}$$

1-2, 1-3, 2-6, 3-5, 4-5, 4-6

$$f(x,y,z) = \bar{x}z \vee yz \vee \bar{x}\bar{y} \vee xy \vee x\bar{z} \vee \bar{y}\bar{z}.$$

. 2.4.

2.4.

n/n		1					
		$\bar{x}yz$	$\bar{x}\bar{y}z$	xyz	$x\bar{y}\bar{z}$	$x\bar{y}z$	$\bar{x}\bar{y}\bar{z}$
		1	2	3	4	5	6
1	$\bar{x}z$	*	*				
2	yz	*		*			
3	$\bar{x}\bar{y}$		*				*
4	xy			*	*		
5	$x\bar{z}$				*	*	
6	$\bar{y}\bar{z}$					*	*

1,

$$f_1(x,y,z) = \bar{x}z \vee xy \vee \bar{y}\bar{z} \quad f_2(x,y,z) = yz \vee \bar{x}\bar{y} \vee x\bar{z}.$$

$$f_3(x, y, z) = \bar{x}z \vee \bar{x}\bar{y} \vee xy \vee x\bar{z} \quad f_4(x, y, z) = yz \vee \bar{x}\bar{y} \vee xy \vee x\bar{z} \vee \bar{y}\bar{z}.$$

$$AC \vee B\bar{C} = AC \vee B\bar{C} \vee AB \tag{2.15}$$

$$: f(x, y, z) = x\bar{y} \vee \bar{x}yz \vee yz.$$

$$: f(x, y, z) = x\bar{y} \vee \bar{x}yz \vee yz \vee xz.$$

$$\bar{x}yz \vee yz = yz$$

$$f(x, y, z) = x\bar{y} \vee yz \vee xz.$$

$$f(x, y, z) = xy\bar{z} \vee xz \vee \bar{x}y.$$

$$(x \vee y \vee \bar{z})(x \vee z)(\bar{x} \vee y) = (x \vee y \vee \bar{z})(xy \vee \bar{x}z \vee yz) = xy \vee xy\bar{z} \vee xy \vee \bar{x}yz \vee yz \vee xy\bar{z} = xy \vee yz.$$

2

(2),

$$f(x, y, z) = \vee(1, 2, 3, 4, 5, 6).$$

(.2.5).

$$f(x, y, z) = y\bar{z}\vee\bar{x}z\vee x\bar{y}.$$

$n=3$		y		\bar{y}
x	1	0	1	1
\bar{x}	1	1	1	0
	\bar{z}	z		\bar{z}

.2.5.

$$f(x, y, z) = \vee(1, 2, 3, 4, 5, 6) \quad (.2.6)$$

$$f(x, y, z) = x\bar{z}\vee\bar{y}z\vee x\bar{y}.$$

$$f(x, y, z) = \vee(1, 4, 5, 7) \quad (.2.7)$$

$$f(x, y, z) = xz\vee\bar{y}z\vee x\bar{y}.$$

$$f(a, b, c, d), \quad (.2.8)$$

$$f(a, b, c, d) = \bar{C}\vee D.$$

$n=3$		y		\bar{y}
x	1	0	1	1
\bar{x}	1	1	1	0
	\bar{z}	z		\bar{z}

.2.6

$n=3$		y		\bar{y}
x	0	1	1	1
\bar{x}	0	0	1	0
	\bar{z}	z		\bar{z}

.2.7

$n=4$	b	\bar{b}		
a	1	1	1	1
	0	1	1	0
\bar{a}	1	1	1	1
	\bar{d}	d	\bar{d}	

.2.8

$n=3$		y		\bar{y}
x	1	1	1	1
\bar{x}	1	1	0	0
	\bar{z}	z		\bar{z}

.2.9

$n=3$		y		\bar{y}
x	0	1	0	1
\bar{x}	1	0	0	1
	\bar{z}	z		\bar{z}

.2.10

$$f(x, y, z) = X \vee Y. \quad (.2.9)$$

.2.10,

$$: f(x, y, z) = (\bar{x}\vee\bar{y}\vee z)(x\vee\bar{z})(y\vee\bar{z}).$$

(1, 0, -0,5).

$f(x, y, z)$, 1 3 5
 0 1 (.25) .2.11)

$n=3$	y	\bar{y}
x	0 0 1 0	
\bar{x}	0 1 - -	
	\bar{z} z	\bar{z}

.2.11.

$\bar{X}\bar{Y}Z$, $\bar{X}\bar{Y}\bar{Z}$

(.2.12), $f(x, y, z) = \bar{X}Z \vee \bar{Y}Z$.

$f(x, y, z) = \bar{X}Z \vee \bar{Y}Z \vee \bar{X}\bar{Y}$,

$f(x, y, z) = \bar{X}YZ \vee X\bar{Y}Z$.

$n=3$	y	\bar{y}
x	0 0 1 0	

\bar{x}	0	1	1	0
	\bar{z}	z		\bar{z}

.2.12.

2.6.

	$\bar{X}YZ$	$X\bar{Y}Z$
$\bar{X}\bar{Y}$		
$\bar{X}Z$	*	
$\bar{Y}Z$		*

(.2.6)

$f(x, y, z) = \bar{X}\bar{Y}\bar{Z} \vee \bar{X}\bar{Y}Z \vee \bar{X}YZ \vee X\bar{Y}Z$.

1,

(.2.6),

$f(x, y, z) = \bar{X}Z \vee \bar{Y}Z$.

$\bar{X}\bar{Y}$

1.

$f(x, y, z) = XZ \vee YZ$

$f(x, y, z) = XZ \vee YZ = Z(X \vee Y)$.

$$f(a,b,c,d,e,f) = abe \vee abf \vee acde \vee bcdf.$$

$$f(a,b,c,d,e,f) = ab(e \vee f) \vee cd(ae \vee bf) = ab(ae \vee bf) \vee cd(ae \vee bf) = (ab \vee cd)(ae \vee bf).$$

$$f(a,b,c) = \wedge(2,3,4).$$

$$f^1(a,b,c) = \vee(2,3,4) = \bar{a}\bar{b}\bar{c} \vee \bar{a}bc \vee a\bar{b}\bar{c}, \quad f^1(a,b,c) = \bar{a}b \vee a\bar{b}\bar{c}.$$

$$f_1^1(a,b,c) = (a \vee \bar{b})(\bar{a} \vee b \vee c).$$

$$f(a,b,c) = \wedge(2,3,4), \quad f(a,b,c) = ab \vee ac \vee \bar{a}b = ab \vee \bar{b}c \vee \bar{a}\bar{b},$$

$$f(x_1, \dots, x_n) = F_2[F_1(y_1, \dots, y_s), z_1, \dots, z_k] \quad f(X) = F_2[F_1(Y), Z],$$

$$Y = \{y_1, \dots, y_s\} \quad Z = \{z_1, \dots, z_k\} \quad X = \{x_1, \dots, x_n\},$$

$$= Y \cup Z.$$

$$f(a,b,c,d) = \bar{a}\bar{b}d \vee bc \vee ac.$$

$$ac \vee bc = c(a \vee b) \quad \bar{a}\bar{b} = \overline{a \vee b} \quad f(a,b,c,d) = \bar{a}\bar{b}d \vee c(a \vee b).$$

$$f(a,b,c,d) = F_2[F_1(a,b)], \quad F_1 = a \vee b \quad F_2 = \bar{F}_1 d \vee F_1 c.$$

$$F_1 = \bar{a}\bar{b}, \quad F_2 = F_1 d \vee \bar{F}_1 c.$$

$$f(a,b,c,d,e) = a\bar{b} \vee ade \vee bc\bar{d} \vee b\bar{e}, \quad a\bar{b} \vee ade = a(\bar{b} \vee de) = aF$$

$$\bar{F} = b(\bar{d} \vee \bar{e}) = b\bar{d} \vee b\bar{e} \quad f(a,b,c,d,e) = F_2[F_1(b,d,e), a, c, e] = F_1 a \vee \bar{F}_1(c \vee \bar{e}), \quad F_1 = \bar{b} \vee de.$$

$$Y = \{b, d, e\}, \quad Z = \{a, c, e\} \quad Y \cap Z = \{e\}.$$

2.5.

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11. ?

- 12. ?
- 13. ?
- 14. ?
- 15. ?
- 16. ?
- 17. ?
- 18. 5 ?
- 19. ?
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- 33. .
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- 35. .
- 36. .
- 37. .

3.

3.1.

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6. ...

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4. ;
5. ;
6. ;

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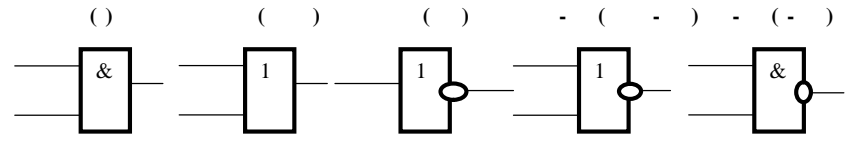
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.3.1.



.3.1.

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 , (155 8).
 3.1.

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155	19 nc	2 - 8	10
555	20 nc	2 - 8	20
555	20 nc	2 - 8	20
531	7,5 nc	4 - 12	10
1531	7,5 nc	4 - 12	10

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 . 3.1.
 , 155,
 .
 1. 155 1, 155 6, 155 7 - -
 (4 -);
 2. 155 4, 155 10 - - (3 -);
 3. 155 3, 155 9, 155 12, 155 13, 155 8 -
 - (2 -);
 4. 155 2 - - (8 -);
 5. 155 1, 155 5, 155 6 - -
 (2 -);
 6. 155 2, 155 3 - -
 (4 -);
 7. 155 3 - - (8 -);
 8. 155 4 - - - 4 ;
 9. 155 3 - - - ,
 ;
 10. 155 1 - (2);
 11. 155 5 - (2);
 12. 155 4 - (3);
 13. 155 1 - (2).
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. 3.2.

3.2.

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JK-			

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14, 16, 24, 48

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$$=]lgN[, \quad N -$$

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=2-4,

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. 3.2),

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(), $500 \cdot 10^6$

2-3 30-199.

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$$= 10^{10} - 10^{15}$$

$$= n/N \cdot T,$$

n -

N -

T -

(1/)

$$1 \cdot 10^{-7} - 5 \cdot 10^{-9}$$

155.

155.

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$5 \pm 0,25$.

- 0,4 B.

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- 5,2 ,

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500:

1. 500 101 - 2 - / ;

2. 500 109 - 5 - / 4 - / ;

3. 500 162 - ;

4. 500 164 - ;

5. 500 180 - ;

6. 500 173 - D- ;

7. 500 141 - ;

8. 500 181 - 16

;

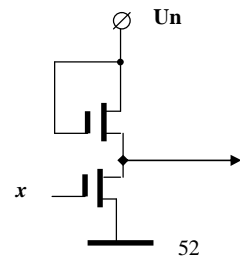
9. 500 410 - 256

;

10. 500 149 - 1024 ;

11.

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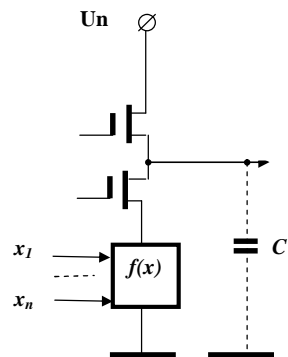
. 3.2.

155 500)

(.3.2).

(.3.2)

x_1, \dots, x_n



. 3.3.

$$y = \overline{*f(x)}$$

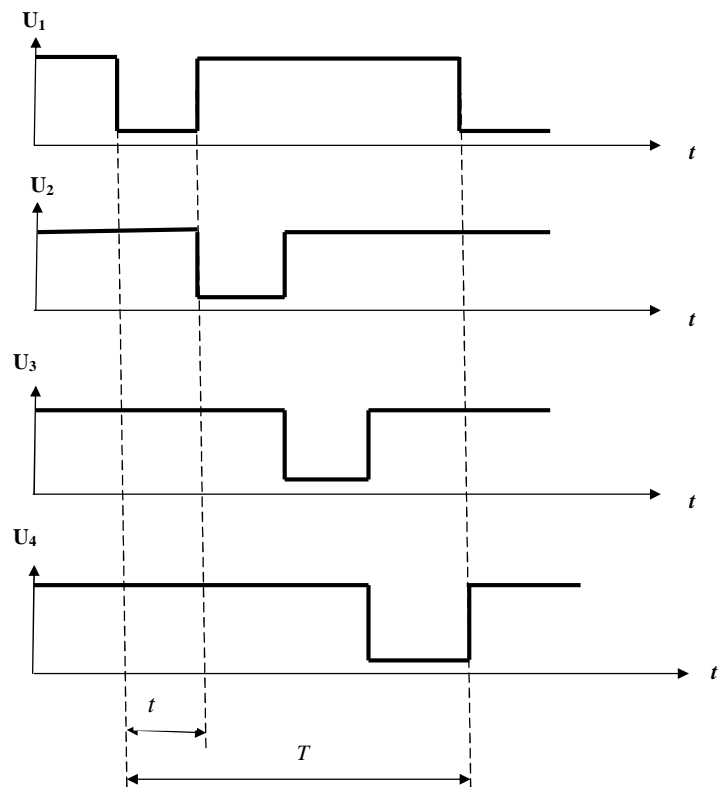
f(x),

(3.1)

3.1,

f(x)

1, 2, 3, 4 (. 3.4).



. 3.4.

(=1, 2, 3, 4)

t,

(=1, 2, 3, 4).

(=1, 2, 3, 4),

(φ_i^{py}),

, φ^{12} -

, φ^{12}

1,

— 2.

3.1.

n	φ^{PY}			p^{SR}
1	φ^{12}	1	2	p^{34}
2	φ^{23}	2	3	p^{41}
3	φ^{34}	3	4	p^{12}
4	φ^{41}	4	1	p^{23}
5	φ^{13}	1	3	p^4
6	φ^{24}	2	4	p^1
7	φ^{31}	3	1	p^2
8	φ^{42}	4	2	p^3

3.2.

φ^{PY}	φ^{PY}
φ^{12}	$\varphi^{23}, \varphi^{34}, \varphi^{13}, \varphi^{24}$
φ^{23}	$\varphi^{34}, \varphi^{41}, \varphi^{24}, \varphi^{31}$
φ^{34}	$\varphi^{41}, \varphi^{12}, \varphi^{31}, \varphi^{42}$
φ^{41}	$\varphi^{12}, \varphi^{23}, \varphi^{42}, \varphi^{13}$
φ^{13}	$\varphi^{34}, \varphi^{24}$
φ^{24}	$\varphi^{41}, \varphi^{31}$
φ^{31}	$\varphi^{12}, \varphi^{42}$
φ^{42}	$\varphi^{23}, \varphi^{13}$

φ^{12} y^{34}
 y^{34} 3 4
 . 3.1.

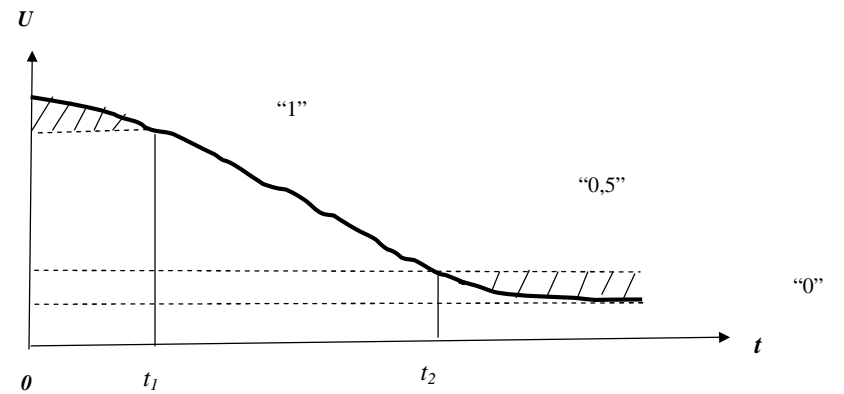
3.1 1 4-

5

8-

φ^{PY}
 (. 3.2).

$$\bar{x} = 1 - x. \tag{3.4}$$



. 3.5.

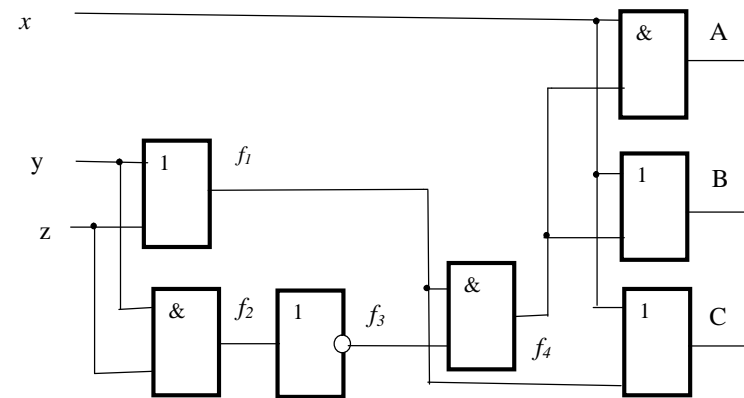
(t)

$$t = 0, 1, 2, \dots, n, \dots$$

("1"; "0,5"; "0"),

$$\bigwedge_{i=1}^n x_i = \min(x_i); \tag{3.2}$$

$$\bigvee_{i=1}^n x_i = \max(x_i); \tag{3.3}$$



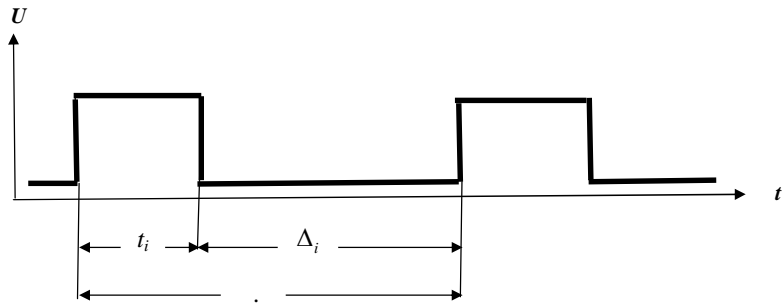
. 3.6.

x(t) t,

(. 3.6).

$$f_1 = y \vee z; f_2 = yz; f_3 = \overline{yz}; f_4 = (y \vee z) \overline{yz};$$

$$A = x(y \vee z)(\overline{yz}); B = x(y \vee z)(yz); C = x \vee y \vee z.$$



. 3.7.

$$t_i (i \in I = \{0, 1, \dots, n, \dots\})$$

(t_i)

$$\Delta_i (i \in I = \{0, 1, 2, \dots, n, \dots\}).$$

$$t_i \Delta_i,$$

$$T_i (i \in I = \{0, 1, \dots, n, \dots\}),$$

$$t_i \Delta_i,$$

$$T_i (i \in I = \{0, 1, \dots, n, \dots\}) (. 3.7).$$

3.1.

$$[x(t), e()]$$

$$T_i = t_i + \Delta_i, (i \in I = \{0, 1, 2, \dots, n, \dots\})$$

(3.5)

3.2.

(t)

(t)

3.3.

(t)

e()

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$$f_{23} = (x, y, z) = \sqrt{(3, 5, 6, 7)}.$$

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., K_{-1} .

(, x, y, z . 3.6).

$0, K_1, \dots, K_N$.

$0, K_1, \dots$

. 3.6,

(

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(,), -

..., K_{-1} .

$0, K_1,$

max

max

f_1, f_2, \dots, f_n

f_1, f_2, \dots, f_n

$f_1 f_2; f_1 f_3; \dots; f_1 f_2 \dots f_1 \dots f_n.$

$max,$

$:$

3.2.

K

n

n

K

n

$f_1, \dots, f_k.$

$*$

$$f(a,b,c) = ab \vee \bar{a}\bar{b}; \quad \varphi(a,b,c) = ab \vee \bar{a}\bar{b} \vee bc,$$

$$\varphi(a,b,c) = f(a,b,c) \vee bc$$

15 10

. 3.10).

f_1, f_2, f_3

(. 3.8 –

$$f_1 \vee f_2, \vee f_3 (. 3.11).$$

1, 2, 3

f_1, f_2, f_3

f_1	b	\bar{b}		
	1	1	1	1
a	1	1	1	1
	1	1		
\bar{a}				
	\bar{d}	d	\bar{d}	

.3.8.

f_2	b	\bar{b}		
		1	1	
a		1	1	
	1	1		
\bar{a}		1		
	\bar{d}	d	\bar{d}	

.3.9.

f_3	b	\bar{b}		
	1	1	1	1
a	1	1		
	1	1	1	1
\bar{a}		1		
	\bar{d}	d	\bar{d}	

.3.10.

f_1, f_2, f_3	b	\bar{b}		
	1	1	1	1
			2	2
	3	3		3
a	1	1	1	1
			2	2
	3	3		
	1	1		
	2	2	2	
	3	3	3	3
\bar{a}				
			2	
			3	
	\bar{d}	d	\bar{d}	

.3.11.

$f_1 \vee f_2, \vee f_3$

f_1	b	\bar{b}		
a	3	4		
			5	1
\bar{a}			2	
	\bar{d}	d	\bar{d}	

.3.12.

(. 3.12 -
1 f3).

f_1, f_2, f_3 .

$f_3 - 1; f_2, f_3 - 2; f_1, f_3 - 3; f_1, f_2 - 4; f_1, f_2, f_3 - ; f_1, f_3 - 6$ (. 3.12).

1 - 6

f_1, f_2, f_3 .

k

$r < k - 1$.

$f(a, b, c, d) = a$.

$_1 = 24$):

$$\begin{aligned} f_1 &= a \vee \bar{a}bc; \\ f_2 &= \bar{a}\bar{b}d \vee \bar{a}bc \vee \bar{a}\bar{b}; \\ f_3 &= \bar{a}\bar{b}d \vee \bar{a}\bar{c}\bar{d} \vee \bar{a}c \vee ab. \end{aligned}$$

$_2 = 28$).

$$\begin{aligned} f_1 &= a \vee bc; \\ f_2 &= \bar{a}\bar{b} \vee \bar{a}bc \vee \bar{b}\bar{d}; \\ f_3 &= \bar{a}\bar{b}d \vee \bar{a}\bar{c}\bar{d} \vee \bar{a}c \vee ab. \end{aligned}$$

f_1, f_2, f_3

(. 3.13).

$n=3$					\bar{y}
f_3	y				
x	1	0	0	0	
\bar{x}	0	1	0	0	
	\bar{z}	z	\bar{z}		

$n=3$					\bar{y}
f_2	y				
x	1	1	0	0	
\bar{x}	0	1	0	0	
	\bar{z}	z	\bar{z}		

$n=3$					\bar{y}
f_1	y				
x	1	1	1	0	
\bar{x}	0	1	0	0	
	\bar{z}	z	\bar{z}		

. 3.13.

f_1, f_2, f_3

f_2
 $f_1 f_3$

f_2 f_1

f_2

(. 3.14).

$x\bar{y}z$.

$f_1 = f_2 \vee x\bar{y}z$

$x\bar{y}z$

xyz ,

$f_1 f_2$,

$x\bar{y}z$

xz ,

$f_1 = f_2 \vee xz$.

f_3

f_2

xyz .

f_2 ,

$(\bar{x} \vee \bar{y} \vee \bar{z})$.

$f_1 = \overline{f_2(x, y, z)}$;
 $f_2 = xy \vee xz \vee yz$.

$n=3$					\bar{y}
f_1	y				
x	0	1	0	1	
\bar{x}	1	0	1	0	
	\bar{z}	z	\bar{z}		

$n=3$					\bar{y}
f_2	y				
x	1	1	1	0	
\bar{x}	0	1	0	0	
	\bar{z}	z	\bar{z}		

$n=3$					\bar{y}
f_2	y				
x	0	0	0	1	
\bar{x}	1	0	1	1	
	\bar{z}	z	\bar{z}		

. 3.14.

$f_1 f_2$

3.3.

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$$f_1 = \overline{f_2(x, y, z)};$$

$$f_2 = xy \vee xz \vee yz.$$

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4.1.

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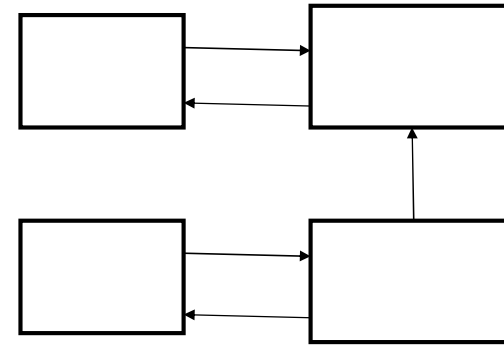
„Intel”

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[21].

(.4.1).



.4.1.

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60- 70- [4, 13, 26, 27, 40].

„ ”.

[10].

[13, 26].

[26].

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[1-6, 8-11, 13-17, 22-32, 34-39].

() (t) (L>1).

(t)

[10].

[26].

(t)

$\{X\} \{Y\}$ L

f $(L=1)$.

$D_A = \{A_i\}$, $i=1, 2, \dots, L$

$\{X\} \xrightarrow{f_i} \{Y\}$, L f

(L>1).

(t)

[26].

80-

90-

[12, 18-21].

[12, 26].

$$t_i (i = 0, 1, 2, \dots),$$

$$e(),$$

$$t_i,$$

$$x(t),$$

$$e()$$

$$()$$

$$e()$$

$$t_i.$$

$$j (j=1, 2, \dots, C).$$

$$4.1. t_j$$

$$4.2. j$$

$$4.3. j$$

$$j = t_j + j (j \in J = \{0, 1, 2, \dots, n, \dots\})$$

$$4.4. 0$$

$$4.5. 0$$

$$t_j$$

$$0 = t_j + 0$$

$$t_i$$

$$(1, 2).$$

$$(4.1)$$

$$(4.2)$$

4.6.

$$j (j=1, 2, \dots, C)$$

t_j

t_j

o

j

j

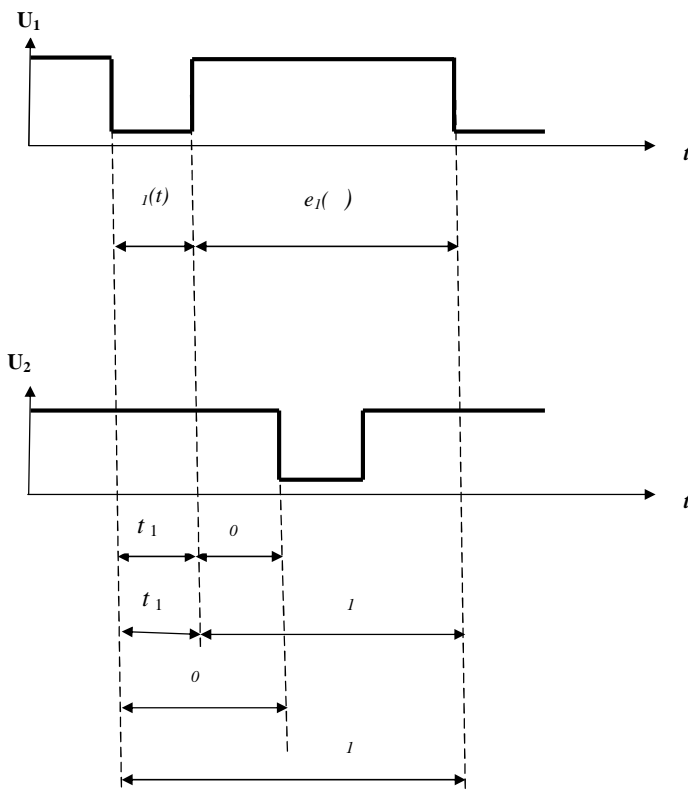
$$j = j - o$$

$$(4.3)$$

o

$$T_a = \sum_{j=1}^c (T_0)_j$$

$$(4.4)$$



. 4.2.

t,

,
 -
 ,
 - [5, 10, 11, 30, 38].
 ,
 (),
 (,), [10].
 [10],
 [21].
 -
 (),
 ,
 (,),
 =
 :
) - , ((,) -
 ,) () -

,
 (t) (t) t
 y(t) = λ [x(t)] (4.5)
 ()
 [1, 3, 8-12, 14, 29-32].
 () [1, 3, 8, 9, 11, 30, 34]
 (t) (t)
 (t),
 () [12, 18-21]
 (t)
 (t), ()
 () ()
 () ()
 ()
 :
 (t) = [(t)]. (4.6)
 (t)
 () t.
 (,)
 :
 () = [(t), ()], () = (t) ∪ (), (t), () ∈ (4.7)

$(t) \quad ()$
 $(t), \quad () \in$
 $() = [(t), ()], (t) (), (t), () \in \mu. \quad (4.8)$

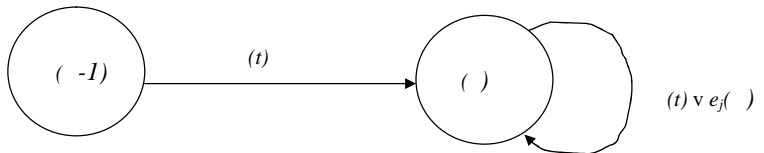
$(t) \quad () \quad o(.4.4)$
 $(t) \quad (t), \quad \mu((t), () \in \mu)$
 $j \quad \mu$
 $() \quad () \quad j$
 $() \quad \mu$
 $(t) \quad j()$

$(t) \quad () \quad (t) (4.6).$
 $() \quad ()$
 $(t) ()$
 $i \quad 2$
 μ
 $e_j(), \quad 2()$
 $(t) e_j(),$

$$() = i [p(t), ()], () \in \quad (4.9)$$

$$() = 2 [(t), ()], () \in \mu \quad (4.10)$$

$i() = p(t), j()$
 $p(t), \quad j()$
 $p(t), \quad j()$
 $o(.4.4)$
 $i \quad j$
 $j()$
 $2() = (t), j()$
 $(t), \quad ()$
 $(t) \quad (t)$
 $j()$
 $o(.4.4)$
 $() \quad \mu,$
 $2,$
 $j()$



.4.3.

$$() = [p(t), ()], () \in \quad (4.11)$$

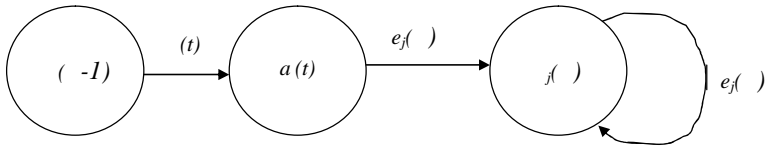
$() -$

4.7.

() , ()
 $i(t)$,
 $(t) e_j(t)$,
 $z(t)$,
 $(t) e_j(t)$,
 $()$.

4.8.

() , ()
 Q () ,
 $(t) e(t)$,
 $()$.



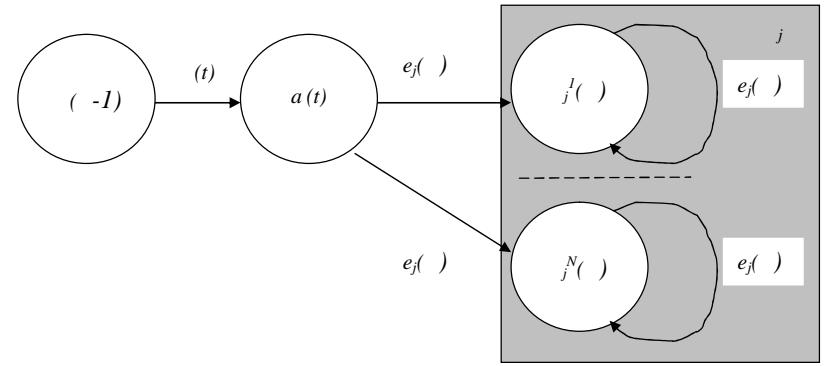
.4.4.

, () ()
 : ,
 () ()
 . 4.3 - 4.7.

$$() = (t), j(t).$$

(4.9)

(4.3) - (4.7).



.4.5.

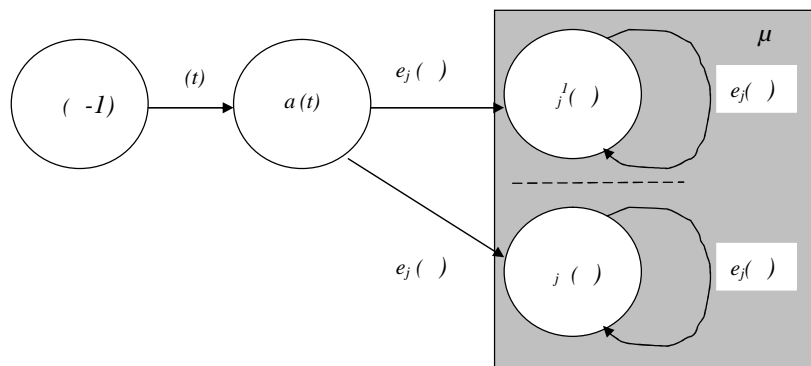
$$() = z[a(t), a(t)], \quad a(t) = a(t) \quad (4.12)$$

$$() = z[a(t)], \quad a(t) = a(t) \cup a(t) \quad (4.13)$$

$a(t)$

$$() = z[a(t), ()]. \quad (4.14)$$

$a(t)$



.4.6.

4.9.

(4.14) (4.15)

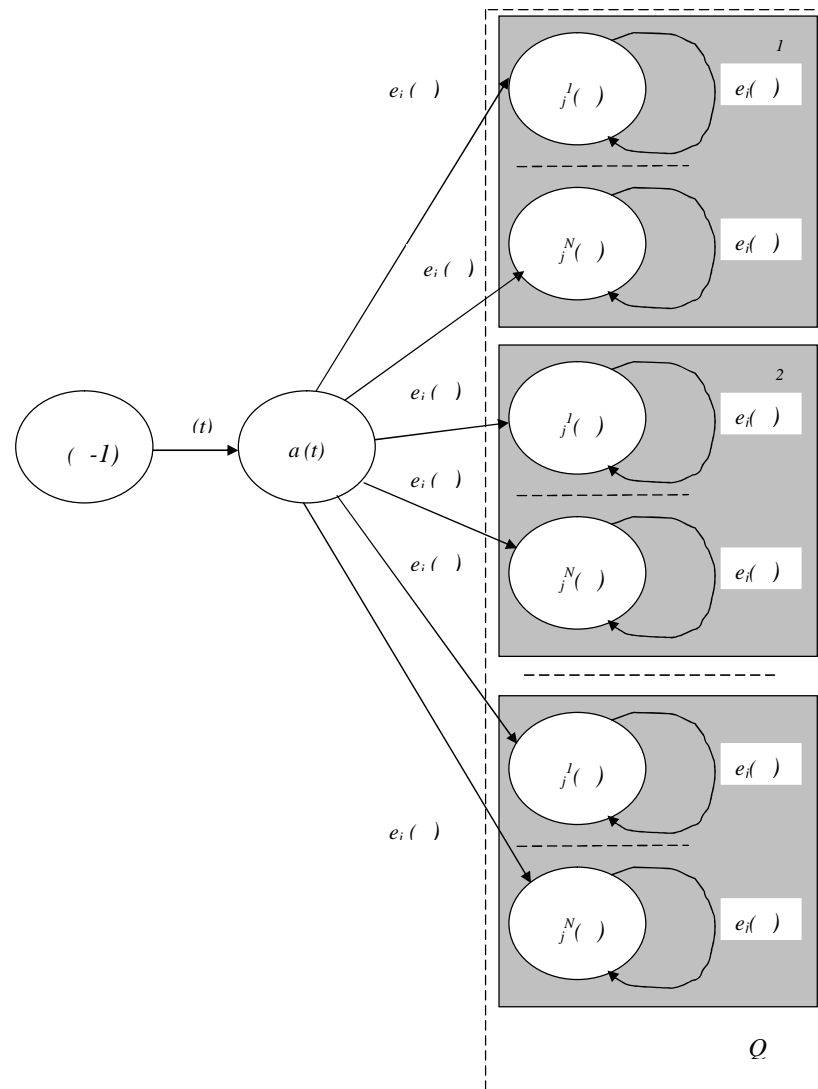
(4.16)

4.9

4.10.

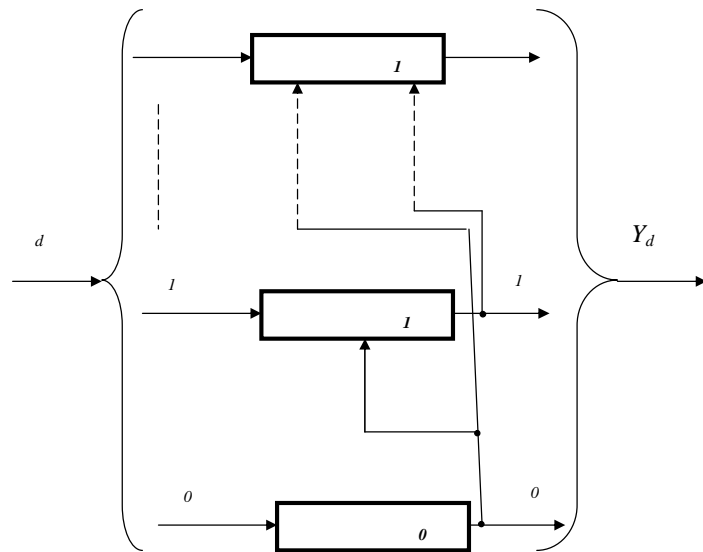
() 0, 1, ..., K,
 ()
 () 0, 1, ..., K

m [12, 21].



.4.7.

()



.4.8.

D

$$D_j (j = \{1, 2, \dots, m\}, m \geq 2),$$

$$(j = 1, 2, \dots, m) \quad 0,$$

(.4.10).

K - D $m_i (i = 1, 2, \dots, K)$

() [12], :

$$M_d = \prod_{i=1}^K m_i \quad (4.15)$$

$$M_a \leq \prod_{j=1}^n M_{d_j} \quad (4.16)$$

D_j ()

$f(\cdot)$ D_j (.4.10).

D_j D_j D_j

$(j = 0, 1, \dots, K)$

$x(t)$ Y_{d_j} D_j $(-I)$

$$y_i^1 = \varphi_1[a(\Delta-1), x(t)] \quad (4.17)$$

(t)

(),
[() = (t), ()],

() ,
 $Y_{d_j} \quad D_j$

$$y_i^2 = \varphi_2[a(t), a(\Delta)] = \varphi_2[a(T)] \quad (4.18)$$

() ,

$Y_{d_j} \quad D_j$

().

$$y_i^3 = \varphi_3[a(\Delta), e(\Delta)] \quad (4.19)$$

$x(t)$,

. 4.11.

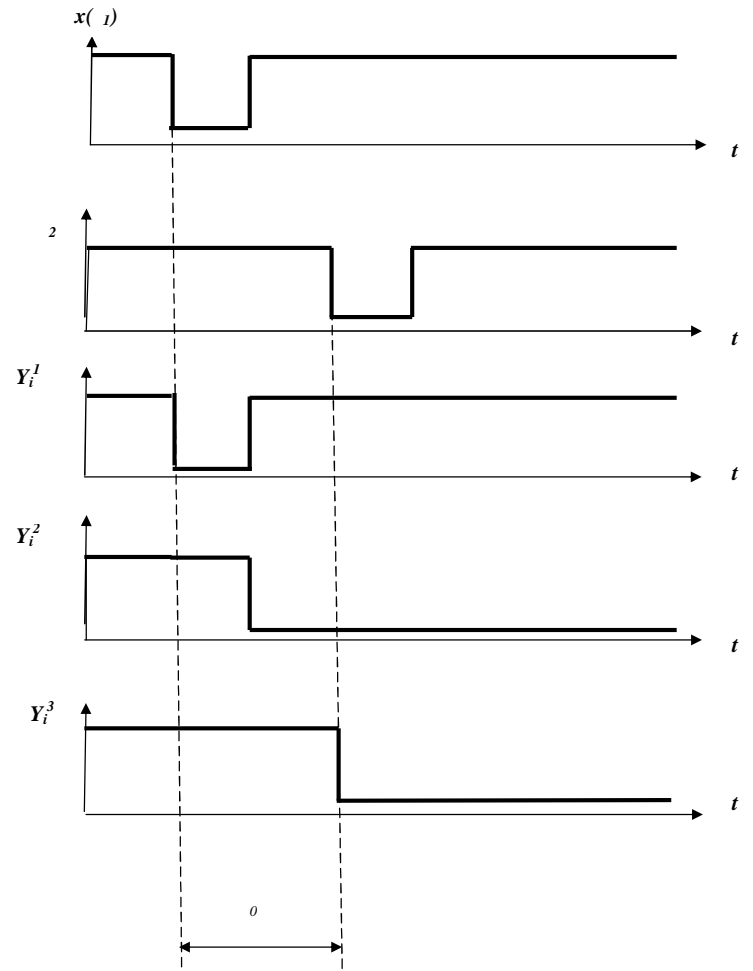
$Y_{d_j} \quad D_j$

D_j ,

+1.

(>1) D_j ,

(>2) D_j ,



. 4.9.

$Y_i^2()$, $Y_i^3()$, $Y_i^4()$

D_j

D_j

$l(t) = 1$,
 D_j
 2
 D_j
 3
 D_j
 0
 $(-I)$
 (4.13)

(4.21):

$$\begin{cases} y_1^1 = \varphi_1^1(x_1, \dots, x_e, a_{c_1}, \dots, a_{c_p}); \\ \dots \\ y_{k_1}^1 = \varphi_{k_1}^1(x_1, \dots, x_e, a_{c_1}, \dots, a_{c_p}). \end{cases} \quad (4.21)$$

(4.22):

$$\begin{cases} y_1^2 = \varphi_1^2(a_{c_1}, \dots, a_{c_p}); \\ \dots \\ y_{k_2}^2 = \varphi_{k_2}^2(a_{c_1}, \dots, a_{c_p}). \end{cases} \quad (4.22)$$

(4.23):

$$\begin{cases} y_1^3 = \varphi_1^3(e_{j_1}, \dots, e_{j_p}, a_{d_1}, \dots, a_{d_p}); \\ \dots \\ y_{k_3}^3 = \varphi_{k_3}^3(e_{j_1}, \dots, e_{j_p}, a_{d_1}, \dots, a_{d_p}). \end{cases} \quad (4.23)$$

$= (e_{j_1}, \dots, e_{j_p}) -$
 $= (e_{j_1}, \dots, e_{j_p}) -$
 $a_d = (a_{d_1}, \dots, a_{d_p}) -$
 $a_c = (a_{c_1}, \dots, a_{c_p}) -$
 $^1 = (\varphi_1^1, \dots, \varphi_{k_1}^1) -$
 $^2 = (\varphi_1^2, \dots, \varphi_{k_2}^2) -$
 $^3 = (\varphi_1^3, \dots, \varphi_{k_3}^3) -$
 $= (\varphi_{B_1}, \dots, \varphi_{B_p}) -$

4.11.

[10],

[21].

4.3.

[11].

(4.12)

() - [11]

$$S = (X, Y, Q, a_0, \dots), \quad (4.24)$$

$$\begin{aligned} X - & \dots; \\ Y - & \dots; \\ Q - & \dots; \\ a_0 - & (a_0 \in Q); \\ D \subseteq X^* Q & \dots; \\ D \subseteq X^* Q & Y. \end{aligned}$$

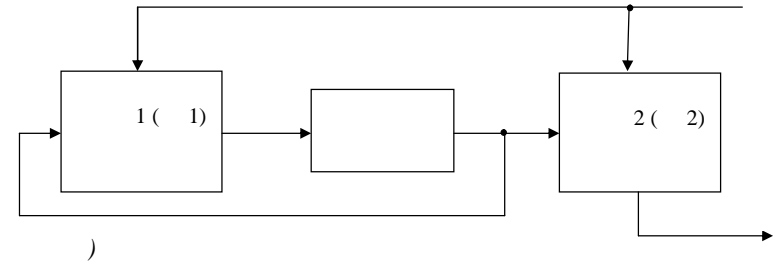
Y, Q.

$t = 0, 1, 2, \dots, n, \dots$ [10].

$$\begin{aligned} & (t) \dots Q \\ & t = 0 \\ & \dots t, \dots 0, \\ & (t) \dots Y \end{aligned}$$

$$\begin{cases} a(t) = \delta[a(t-1), x(t)], \\ y(t) = \varphi[a(t-1), x(t)], \\ (t = 1, 2, \dots, n, \dots), \end{cases} \quad (4.25)$$

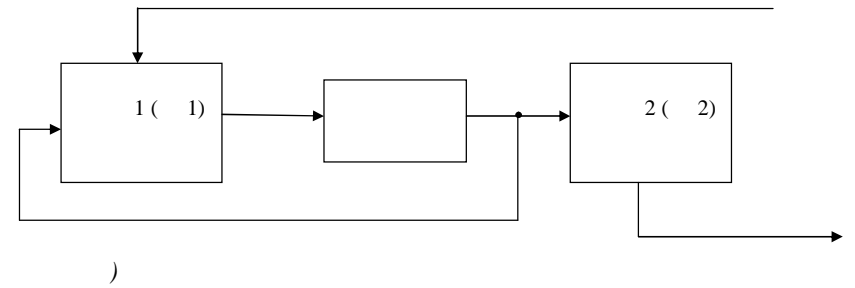
$$\begin{cases} a(t) = \delta[a(t-1), x(t)], \\ y(t) = \varphi[a(t)], \\ (t = 1, 2, \dots, n, \dots). \end{cases} \quad (4.26)$$



() a ()

$$= (, Y, Q, , , a_0, e_0, e), \quad (4.27)$$

, Y, Q, , , a_0,



(4.24);

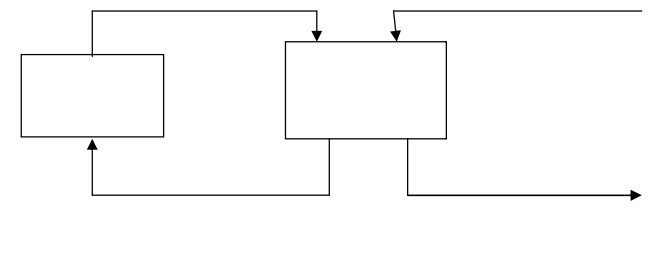
$a(0 \notin) -$, ;
 $e: Q^* \rightarrow Q -$,
 $D_{e \subseteq Q^* \rightarrow Q} : Q, \quad (\in Q)$

$a(0 \notin)$, , ,
 (\in) .

$$U = \quad (4.28)$$

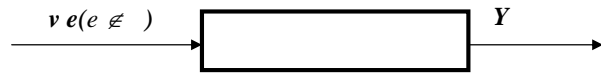
, $j (j \notin)$

$(\in) -$



. 4.12.

. 4.13.



. 4.13. 8-

Y.

$a_0,$

$(0), x(1), x(2), \dots$

$(0), (1), (2), \dots$

$e_0(0), e_0(1), e_0(2) \dots$

$(,) \quad Q^* (\in Q, \in X) \quad (, 0)$

$Q^* 0(\in Q, 0 \notin X).$

$(,) \quad Q^* X(\in Q, \in X),$

$(\quad). \quad (t)$

(t)

$0,$

(t)

(t)

Q

$(, 0) \quad Q^* 0.$

$(,)$

(\quad)

$(, 0)$

[1-6, 8-11, 13-16, 23-32, 34-37, 39, 40]

$\lambda: X \rightarrow Y$, $\lambda \in Y$.
 $(\lambda \in Y)$.
 [3].

$\xrightarrow{f_i} \{Y\}$, $f_i \in Y$,
 $i=1, 2, \dots, L$,
 $D_A = \{A_i\}$,
 $\in D_A$.

$()$,
 $()$ [4, 13, 26, 27, 37, 40].

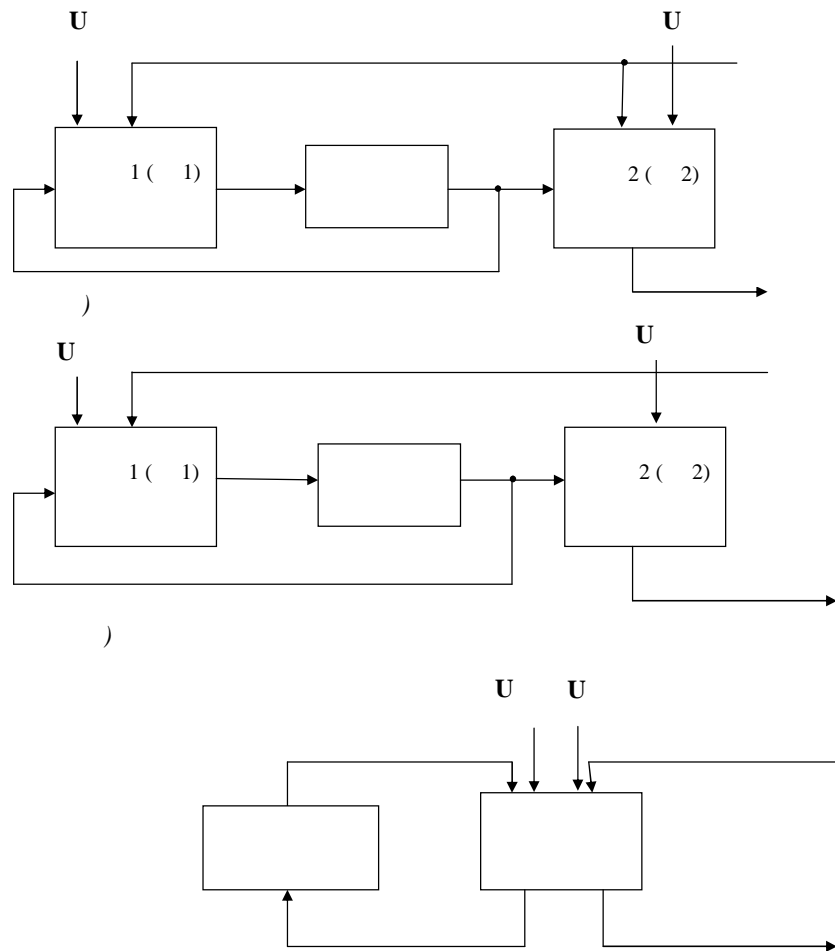
$A = \{X, Y, Q, \Delta, \Lambda, Q_0, U, f\}$, (4.29)
 $Y -$;
 $Q -$;
 $(= \{ i \}, i > 1)$;
 $(= \{ i \}, i > 1)$;
 $Q_0 - (Q_0 \in Q)$;
 $U - (U = \{U, U \})$;
 $f - (f_i: U * U * i, i = 1, 2, \dots, L, L \leq Q)$.

$A_i = \{X_i, Y_i, Q_i, \delta^{(i)}, \varphi^{(i)}, a_0^{(i)}\}$, (4.30)
 (4.24)

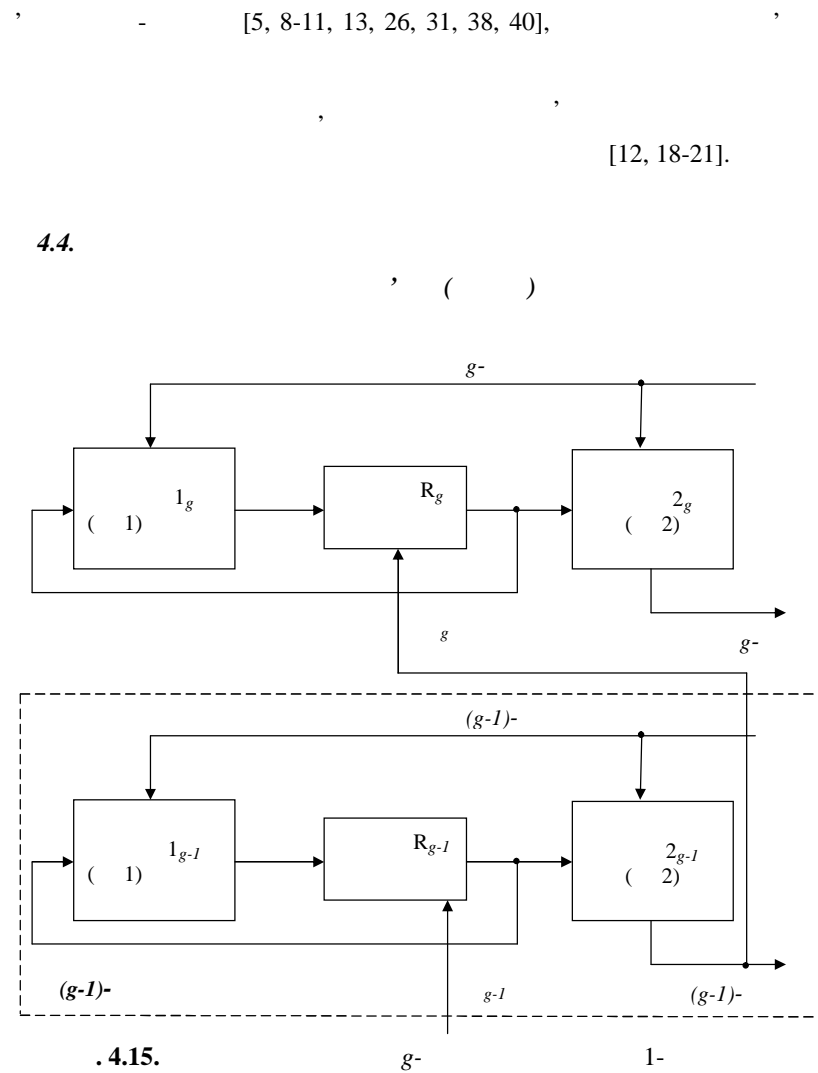
.4.14.
 (4.25) (4.26),

$$\begin{cases} a^{(i)}(t) = \delta^{(i)}[a^{(i)}(t-1), x^{(i)}(t), U_\delta^{(i)}(t)]; \\ y^{(i)} = \varphi^{(i)}[a^{(i)}(t-1), x^{(i)}(t), U_\delta^{(i)}(t)]; \\ (t = 1, 2, \dots; i = 1, 2, \dots, L), \end{cases} \quad (4.31)$$

$$\begin{cases} a^{(i)}(t) = \delta^{(i)}[a^{(i)}(t-1), x^{(i)}(t), U_\delta^{(i)}(t)]; \\ y^{(i)} = \varphi^{(i)}[a^{(i)}(t), U_\varphi^{(i)}(t)]; \\ (t = 1, 2, \dots; i = 1, 2, \dots, L). \end{cases} \quad (4.32)$$



. 4.14.

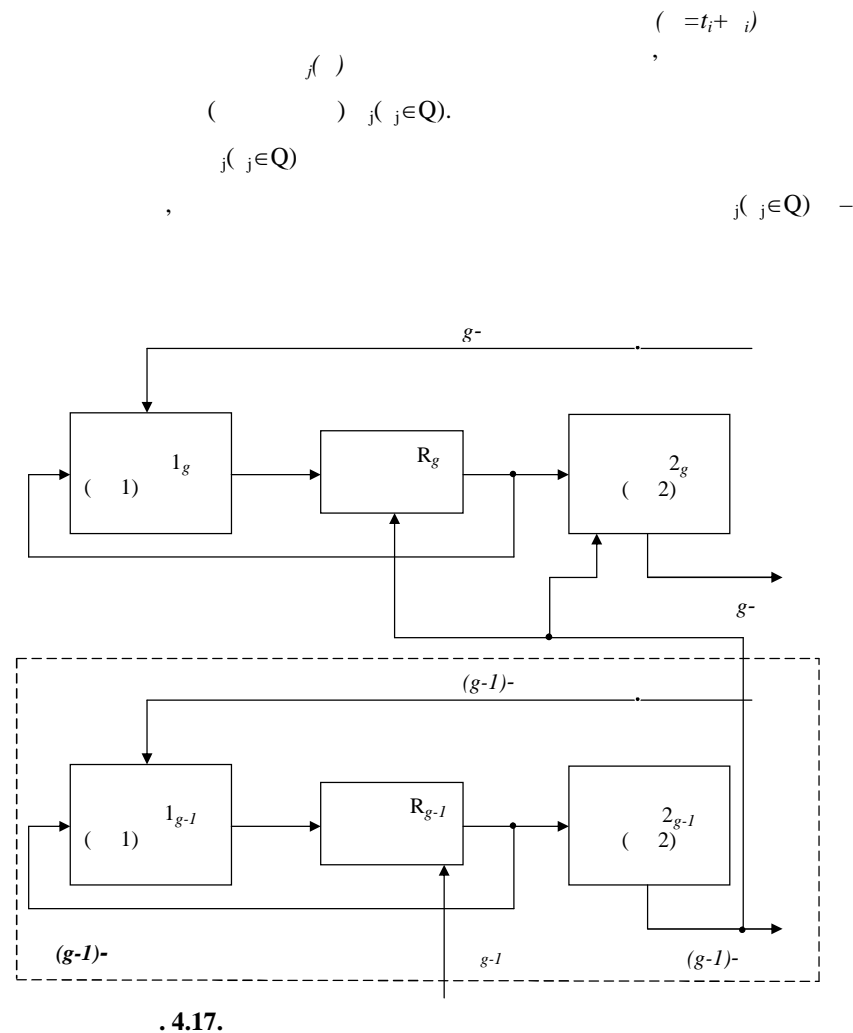
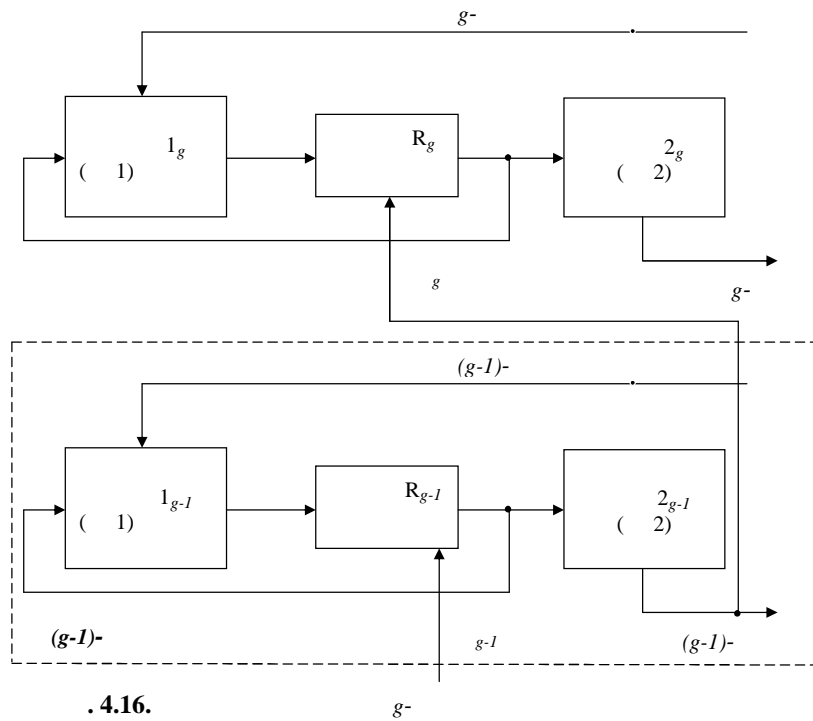


. 4.15.

[12].

g^- $(g > 1)$
 $R_j (j=1, 2, \dots, g),$

$(1, 2, \dots, g)$,
 $g(\dots)$,
 $(g-1)-$,
 $g(\dots)$,
 $g-$,
 $(g-1)-$,
 . 4.15, 4.16, 4.17.



R_g

(\dots)

$g-$

$f(\dots)$

$g(j \in Q)$

(g-1)-

(.4.15, 4.16, 4.17).

(.4.9).

-
-
-

$f()$

U

(g-1)-

R_g

() ,

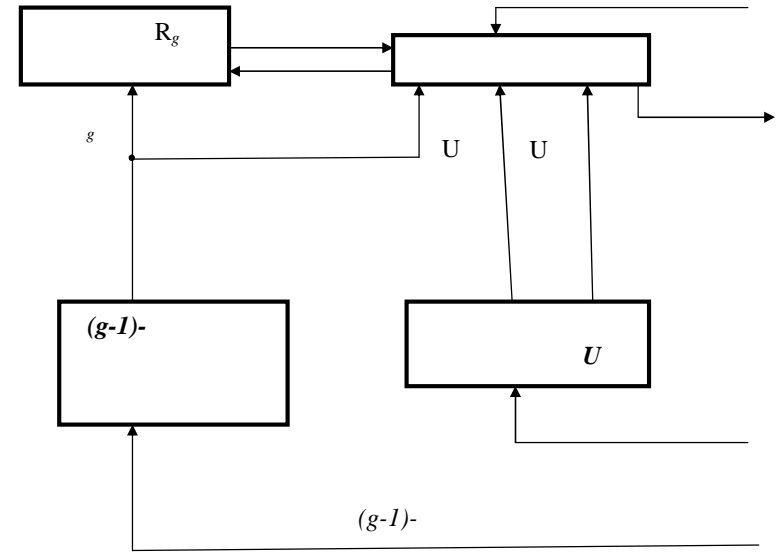
$U (g-1)-$

.4.18.

$U U$

t,

[4, 13, 26, 27, 37, 40]



.4.18.

(.4.11)

[21]:

$$A = (X, E, Y_1, Y_2, Y_3, Q, \pi, e_0, \delta_0, \delta_e, \delta_e, \varphi_1, \varphi_2, \varphi_3), \tag{4.33}$$

1. $X = \{x_0, x_1, \dots, x_{N-1}\}$ -

();

2. $E = \{e_0, e_1, \dots, e_{R-1}\} -$ ()
3. $Y_1 = \{Y_0^1, Y_1^1, \dots, Y_{K_1-1}^1\} -$ 1 ()
4. $Y_2 = \{Y_0^2, Y_1^2, \dots, Y_{K_2-1}^2\} -$ 2 ()
5. $Y_3 = \{Y_0^3, Y_1^3, \dots, Y_{K_3-1}^3\} -$ 3 ()
6. $Q = \{a_0, a_1, \dots, a_{m-1}\} -$ ()
7. $\pi = \{\pi_0, \pi_1, \dots, \pi_{R-1}\} -$ j ()
8. $e_0 \in E -$,
9. $e_0 \in e_0 (\bigcup_j \pi_j = Q) -$;
10. $e_0: Q^*X \rightarrow Q -$,
 $D_{e_0} \subseteq Q^*X \rightarrow Q.$, e_0 „
 $[a_i(-1), x_k(t)]$
 $a_s(t) = e_0[a_i(-1), x_k(t)], a_s \in Q;$
11. $e: Q^* \times \prod_j -$ j $a_s \in \prod_j$
 $D_e \subseteq Q^* \times \prod_j$, e
 $[a_s(t), \prod_j ()]$
 $a_s() = e[a_s(t), \prod_j ()], a_s \in \prod_j (j \in Q);$
12. $y: Q^* \times E \rightarrow \prod_j -$,
 $D_y \subseteq Q^* \times \prod_j$, y
 $[a_s(t), \prod_j ()]$
 $a_K() = y[a_s(t), \prod_j ()], a_s \in \prod_j, a_K \notin \prod_j (j \in Q);$
13. $i: Q^*X \rightarrow Y_i -$ 1,
 $D_i \subseteq Q^* \times Y_i.$ i „ -

14. $z: \prod_j Y_2 -$ 2,
 $D_{z_2} \subseteq \prod_j Y_2.$ 2 „ $[a_s(t), a_s()]$
 $Y_L^2(T) = z_2[a_s(t), a_s()], a_s \in$
 $\prod_j (j \in Q);$
15. $z_3: Q^* \times Y_3 -$ 3,
 $D_{z_3} \subseteq Q^* \times Y_3.$ 3 „ -
 $[a_K(), m()]$ 3
 $Y_L^3() = z_3[a_K(), m()].$
 $i, 2, 3,$
 $a_i(-1) a_s(t),$ $a_b a_s (j \in Q)$
 $() = (t), j() (.4.3).$ $j()$
 (t)
 $j()$ $t.$
 0 $a_i(-1) a_s(t) \prod_j (a_b, a_s \in \prod_j)$ y
 $a_s(t) a_K() \mu(a_s, a_K \in \mu; a_K \notin \prod_j)$
 $() = s(t), m() (.4.4).$
 $(= ,).$
 $(=),$

$$q_i = y(1), y(2), \dots, y(K),$$

1, 2 3 -

$$e_j()$$

$$()$$

$$e_j()$$

q_i ,

$$q_i = ().$$



. 4.19.

$$(. 4.19)$$

[12, 21].

[10].

4.5.

$Q, X, E, Y.$

$$=0,$$

$o,$

$$o(o \in o).$$

[5, 8-11, 14, 31, 38],

[5, 10, 14].

4.1.

	a_0	a_1	a_2	a_3
x_1	a_1	a_2	a_3	a_3
x_2	a_0	a_0	a_0	a_0

4.2.

x_1				
x_2				

$$(. 4.1)$$

$(t-1)$

$$a_j(t)$$

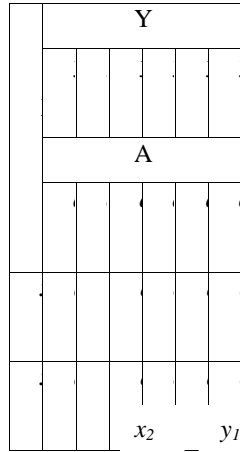
$(t).$

$$(. 4.2)$$

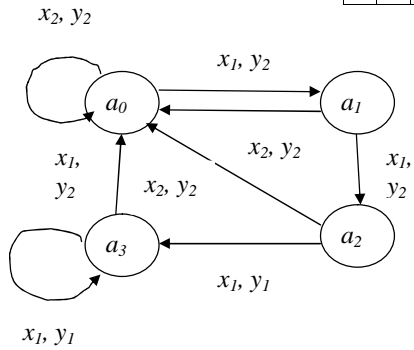
t

$$(. 4.3.).$$

4.3.

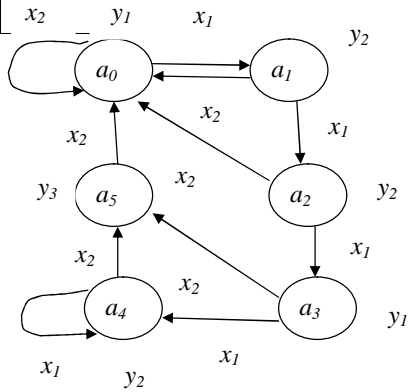


[5, 8-11,



.4.20.

31, 38].



.4.21.

ypa

1

() (.4.21)

4.3-4.7

4.3-4.7.

= 0(,),

T 4.3.

$0^1: Q * X \ Q$

	a_1	a_2	a
x_1	a	a_2	a_1
x_2	a	a_3	a_0

$1 \ 1^{(0)} = j(,)$.

1 T 4.4.

$0^2: Q * X \ Q$

2

x_i				
x_1				
x_2				

$$) , j t$$

(4.35)

T 4.5. 1

$${}^1: Q^*X \ y_1$$

x_i	a_0	a_4	a_5	a_6
x_1	y_1	y_2	y_3	y_4
x_2	y_2	y_1	y_4	y_3

T 4.6. 2

$${}^2: Q^*X \ y_1$$

x_i	a	a	a	a
x_1	y	y	y	y
x_2	y	y	y	y

T 4.7.

$Q^*_{j \ j}$

e_j	Q	a_0	a_1	a_2	a_3	a_4	a_5	a_6	j
e_0		a_0	a_1	a_2	a_3	-	-	-	0
e_1		a_0	-	-	-	a_4	a_5	a_6	1

(. 4.7) j

$$= (, j) \quad j (\in j),$$

$$z() = 0(,$$

T 4.8.

$${}^1: Q^*X \ Q, \ 0 \ 2$$

0	1	2	3
x_i	a_0	a_1	a_3
x_1	a_1	a_3	a_0
x_2	a_3	a_1	a_0

T 4.9.

$${}^2: Q^*X \ Q, \ 1 \ 2$$

1			
x_i			
x_3			
x_4			

T 4.10.

e_j	Q	a_0	a_1	a_2	a_3	a_4	j
e_0		a_0	a_1	-	a_3	-	0
e_1		-	a_1	a_2	-	a_4	1

$: Q^*_{j \ j}$

4.8-4.10.

(4.30)

[31].

t , (t) , $f()$
 μ , $(t), \mu -$
 $f()$. 3 $()$ $o(. 4.9)$

4.11 - 4.13.

T 4.11.

x_i							
x_1							
x_2							

$o: Q^*X Q$

T 4.12. $: Q^* \mu$

μ	μ_1			μ_2		
$e_j \backslash Q$	a_0	a_1	a_2	a_3	a_4	a_5
e_0	a_0	a_0	a_0	a_3	a_4	a_5
e_1	a_1	a_1	a_1	a_3	a_4	a_5
e_2	a_2	a_2	a_2	a_3	a_4	a_5

T 4.13. $3: Q^* 3$

$e_j \backslash Q$	a_0	a_1	a_2	a_3	a_4	a_5
e_0	1	-	-	4	5	6
e_1	-	2	-	7	8	9
e_2	-	-	3	10	11	0

29.

30.

?

5.

5.1.

[2, 16].

[23].

[10],

[3, 5, 8-11, 23-32, 34-38].

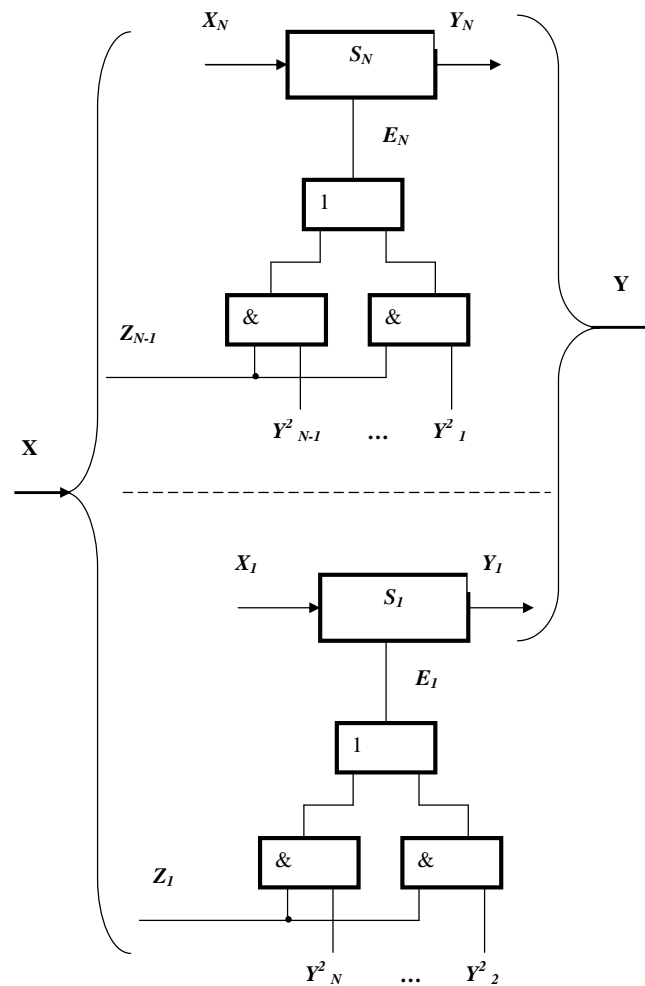
[2, 6, 9, 40].

) [12, 18-21]

[12].

(),

[21].



.5.1.

5.2.

..., (),

j

()

5.1.

$S_i (i=1, \dots, N)$ (5.1)

()

S_i (5.1).

S_i S_i

S_i [26].

S_i

5.1.

F_I N

$F_I = (S_1, S_2, \dots, S_N)$, (5.1)

S_i 16-

$S_i = (Z_i, Y^1, Y^2, Y^3, Q_i, e_{0i}, a_{0i}, \delta_{0i}, \delta_{ei}, \delta_{yi}, \varphi_{1i}, \varphi_{2i}, \varphi_{3i})$, (5.2)

- ;

E_i - ;

Z_i - ;

Y_i^1 - 1;

Y_i^2 - 2;

Y_i^3 - 3;

Q_i - ;

i - ij - ;

e_{0i} - ;

a_{0i} - ;

$o_i: Q_i * X_i \rightarrow Q_i$ - ;

$e_i: Q_i * e_{ij} \rightarrow ij$ - ij ;

$y_i: Q_i * E_i \rightarrow ij$ - ij ;

$1_i: Q_i * X_i \rightarrow Y_i^1$ - 1;

$2_i: ij \rightarrow Y_i^2$ - 2;

$3_i: Q_i * E_i \rightarrow Y_i^3$ - 3,

S_i

$F_A = (X, E, Z, Y^1, Y^2, Y^3, Q, E_0, Q_0, f_0, f_e, f_y, 1, 2, 3)$, (5.3)

$X = \{X_1, X_2, \dots, X_N\}$ - ;

$E = \{E_1, E_2, \dots, E_N\}$ - ;

$Z = \{Z_1, Z_2, \dots, Z_N\}$ - ;

$Y^1 = \{Y^1_1, Y^1_2, \dots, Y^1_N\}$ - 1;

$Y^2 = \{Y^2_1, Y^2_2, \dots, Y^2_N\}$ - 2;

$Y^3 = \{Y^3_1, Y^3_2, \dots, Y^3_N\}$ - 3;

$Q = \{Q_1, Q_2, \dots, Q_N\}$ - ;

$= \{1, 2, \dots, N\}$ - ;

$E_0 = \{e_{01}, e_{02}, \dots, e_{0N}\}$ - x x

;

$Q_0 = \{a_{01}, a_{02}, \dots, a_{0N}\}$ - ;

$f_0: Q * X \rightarrow Q$ - ,

$D_{f_i} \subseteq Q * X \rightarrow Q$;

$f_e : Q^*e_j \rightarrow S_i$,
 $D_{f_2} \subseteq Q^*e_j \rightarrow S_i$,
 $f_y : Q^*E \rightarrow S$,
 $D_{f_3} \subseteq Q^*E \rightarrow S$,
 $f_1 : Q^*X \rightarrow Y^1$,
 $D_{\varphi_1} \subseteq Q^*X \rightarrow Y^1$,
 $f_2 : Q^*Y \rightarrow Y^2$,
 $D_{\varphi_2} \subseteq Q^*E \rightarrow Y^3$,
 S ,
 [12],
 $\pi_i = \bigcup_i \pi_{i_j}$

t_0 , S_i ,
 a_{i_0} , $N_{i_0}(t_0) \in X_i$,
 $e_{i_0}(\Delta_0)$,
 a_{i_j} , S_i ,
 t ,
 f_0 ,
 $(t) = \bigcup_i a_{i_j}(t)$,
 S_i ,
 $(\Delta) = \bigcup_i a_{i_j}(\Delta)$,
 f_y ,
 S_i ,
 5.3.
 (4.24)
 [5]
 [11].

$$R_j = Y_j - K_j E_j \quad (5.13)$$

\emptyset .

$$R_j = Y_j - K_j E_j \quad (5.14)$$

$j = \emptyset, j \in R_j$

$$R_j = \emptyset - K_j E_j \quad (5.15)$$

$K_j E_j = Y_j$

$$R_j = Y_j - \emptyset \quad (5.16)$$

$K_j E_j = Y_j$
 $j (= j)$

$$X_j = Y_j - K_j = j \quad (5.17)$$

$j (= j)$
 j
 $j (, j \in j) \quad (5.17)$

$$Y_k = Y_j^i \quad (5.6-5.8)$$

S

[15, 41].

S

j

S,

S

S,

5.4.

1.

, 122 , 1 ;

7.

8.

9.

()
 (>2)
 r_e [12, 18, 19]. [12, 21,
 [1, 3, 5, 11, 23, 24, 30-32],

1.

2.

3.

4.

5.

6.

7.

$$\begin{aligned}
 ae.p_i &\rightarrow Y_1^i - a_1e_1, \\
 p_2 &\rightarrow Y_2^i - a_2e_2, \\
 &\dots\dots\dots \\
 p_q &\rightarrow Y_q^i - a_qe_q,
 \end{aligned}
 \tag{5.18}$$

$$\begin{aligned}
 - & ; \\
 - & ; \\
 - & ; \\
 p_j - & ; \\
 f() & ; \\
 Y_j^i - & ; \\
 j j - & ;
 \end{aligned}
 \tag{5.6 - 5.8}$$

$$j(= j).$$

j .

$$\begin{aligned} a. x_1 &\rightarrow Y_1^i - a_1, \\ x_2 &\rightarrow Y_2^i - a_2, \\ \dots\dots\dots \\ x_q &\rightarrow Y_q^i - a_q. \end{aligned} \tag{5.19}$$

[1, 3, 5, 8 – 11, 30 – 32, 34].

$$r_a \leq m_{N-1} \tag{5.20}$$

$$r \leq r, \tag{5.21}$$

$$r_a \leq (m_{N-1}) \tag{5.22}$$

$$r, \tag{5.21},$$

r .

$$(. 3.4.)$$

$$(. 4.2.)$$

r_a

j

r_a

r

j

r

j

r .

$$ae.p_j \rightarrow Y_j^i - a_j e_j \tag{5.23}$$

1.

$$\begin{cases} t_i^N = d_a^N * x_j^N; \\ \dots\dots\dots \\ t_i^1 = d_a^1 * x_j^1, \end{cases} \quad (5.24)$$

$d_a^i (i=1,2,\dots,N) -$

$x_j^i \in p_j -$

$t.$

2.

$x_j^i(t)$

$a_j(t),$

$a_k()$

$f()$

$o (.4.9)$

$a_k()$

$$\begin{cases} h_e^N = d_a^{N-1} d_a^{N-2} \dots d_a^1; \\ \dots\dots\dots \\ h_e^3 = d_a^2 d_a^1; \\ h_e^2 = d_a^1, \end{cases} \quad (5.25)$$

$h_e^i (i = \overline{2, N} -$

$f()$

3.

Y_j^1

$N-$

$$Y_j^1 = x_j^i d_a^N. \quad (5.26)$$

Y_j^2

$N-$

$$Y_j^2 = d_a^N. \quad (5.27)$$

Y_j^3

$N-$

$h_e^i (i=1,2,\dots,N-1)$

$N-1$

$$Y_j^3 = d_a^N h_e^i. \quad (5.28)$$

1

$S_i,$

1.

2.

M_N

3.

M_N

$$N_a \leq n_1 + n_2 + \dots + n_n \quad (5.29)$$

(=1, 2, ..., n) -

(5.29)

$$N_a \leq n^* \quad (5.30)$$

$$N_a \leq M_N^n \quad (5.31)$$

$$q(=0, 1, \dots, n-1) = q_{n-1} q_{n-2} \dots q_1 q_0 \quad (5.32)$$

$$N_a \leq M_N^{n_1} + M_N^{n_2} + \dots + M_N^{n_m} \quad (5.33)$$

$n_j(j=1, 2, \dots, m)$ -

$$a_i e_j \quad a_j e_j \quad a_i \quad a_j$$

$$d_a^j (j = 1, 2, \dots, N), \quad d_a^j$$

(t)

$$h_i^i (i = 1, 2, \dots, N-1) \quad (5.25)$$

$$d_a^i (i = 1, 2, \dots, N-1) \quad ()$$

$$e^j(\Delta) = \prod_i h_i^k \quad (5.34)$$

$$Y_k^j = \prod_i Y_i^j \quad (5.26 - 5.28)$$

$$Y_k^j = \prod_i Y_i^j \quad (5.35)$$

(j= 1, 2, 3).

5.5.

70-

()

() [36].

5.2,

A_y^1

(5.2)

()

[36]

A_y^2

DC_M

A_M^2

A_M^1

A_M^2

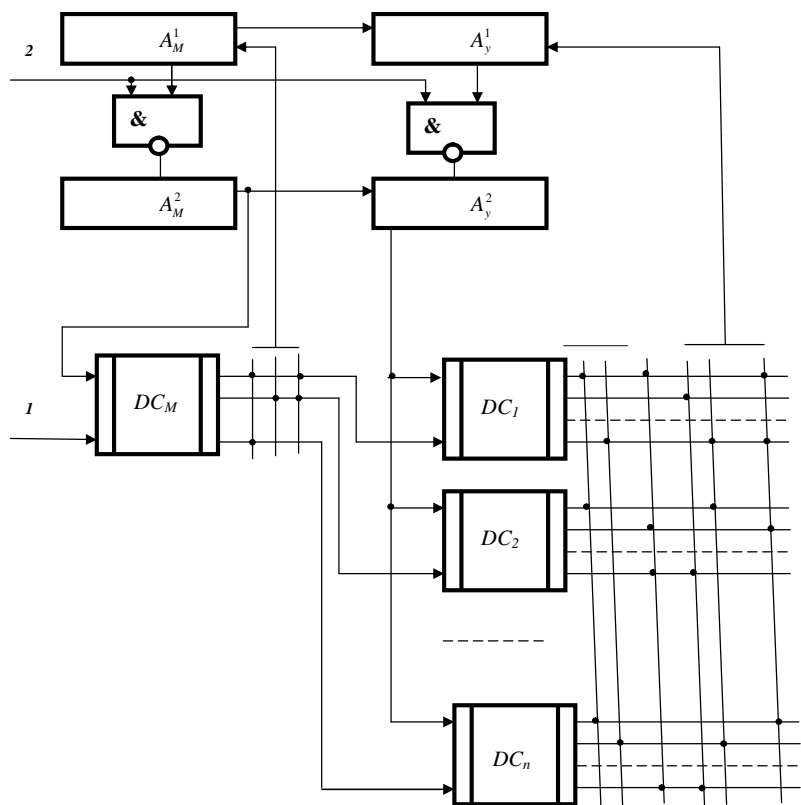
j

A_y^2

(),

1 2,

S_i ,



. 5.2.

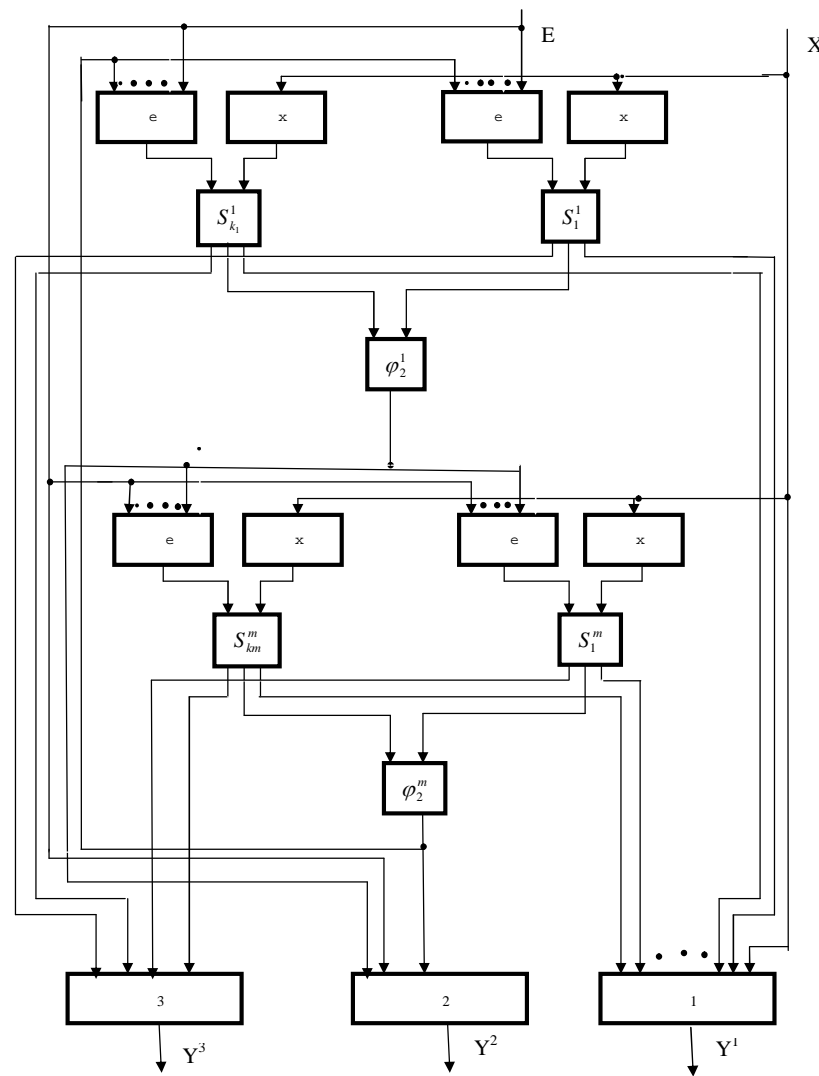
5.6.

(5.1),
(5.11)

$S_i (i=1, 2, \dots, q)$ (5.12).

q

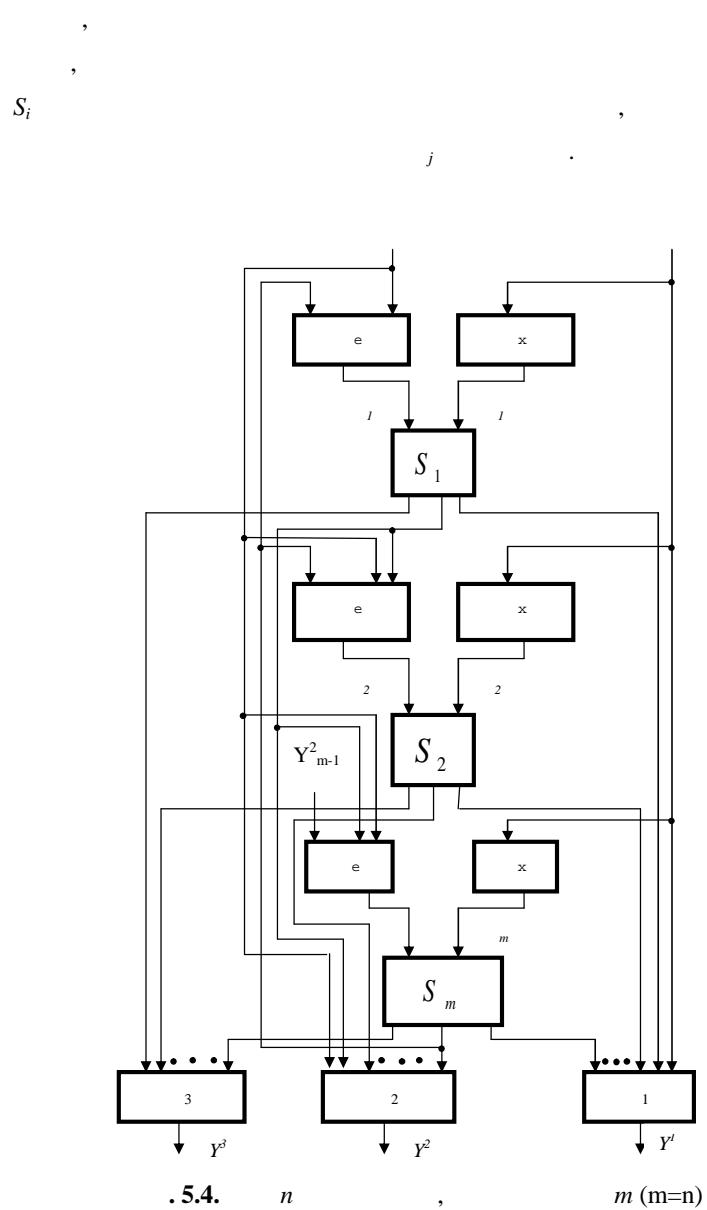
S_i

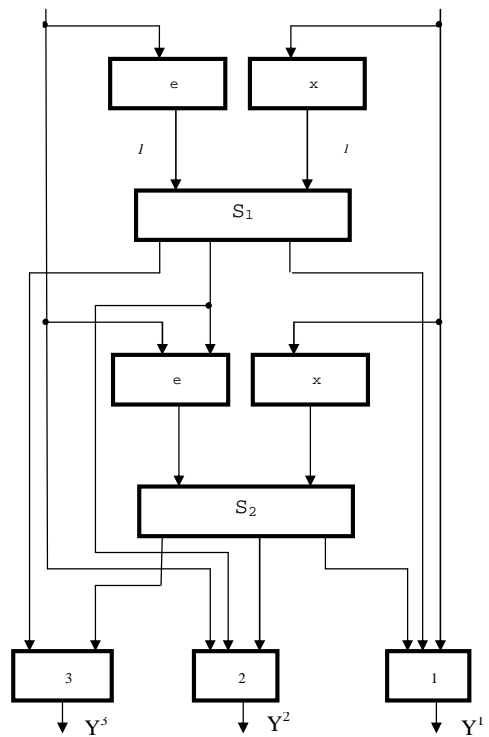


. 5.3.

n
 $m (m \leq n)$

S_i
 $()$
 $F -$
 $(t) \quad x e()$
 $n(n \leq 2)$
 $m(m \leq n)$
 $(.5.3).$.5.4
 S_i
 $m(m = n)$.5.5
 S_i
 $(.5.3) \quad m-$
 $q(q \geq 2)$
 $(t) \quad x e()$
 $(1, 2, 3).$
 2
 $E()$
 S
 j
 $S,$
 j
 $j e_j$
 S_i
 S_i
 $1, 2, 3.$
 $F -$
 x
 e
 S_i
 $S_i (.5.3)$ $F -$





.5.5.

(F -)

S_i

2,

S_i
(F -)

S_i (=2)

S_i (.5.5).

F -

S_i

(),

$x(t)$

()

()

S_1 : , S_1

S_2

S_1 , F -

() = $x(t)$, () -

()

S F -

S

F -

S

F -

6.

6.1.

[1, 6, 31, 32, 39].

[1, 4, 6, 29-32].

[1, 6].

Y $(\{X\} \{Y\})$,

[13, 26, 37].

$(\{X\} \xrightarrow{f_i} \{Y\})$, f_i [26].

[4, 10, 13, 15, 26, 27, 31].

[37].

$(\{X\} \xrightarrow{e_j} \{A\})$, e_j μ

$(\{X\} \xrightarrow{e_j} \{A\})$, e_j μ (4.7) (4.12)

(4.8) – (4.11) (4.14)

[26].

$e_j(t)$, $x_i(t)$

$e_j(t)$.

$j \mu$

0 ,

n ($\in j; \in n$).

2

μ

Q_H ,

j

[21].

„ ”)

$t = (t+k)$

$k = 1,$

$$y(t) = y(t+k)$$

(6.1)

$k > 1$

$(k = 1)$

“0,5”,

$e()$

$(t),$

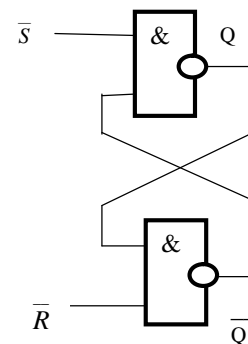
$y,$

5.1.

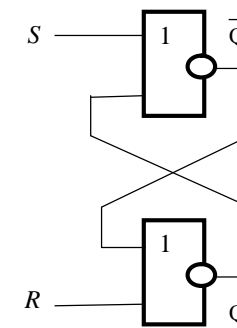
$() ,$

$e()$

$e()$



. 6.1. RS-



RS-

$(-)$

$(-) ,$

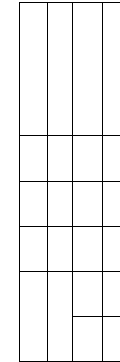
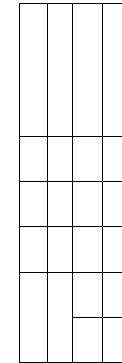
RS-

(6.1).

D-, T-, E-, D-V-, JK-

RS-

6.1. RS-



).

RS-

()

RS-

RS-

.1.1

RS-

(“0”, “0,5”, “1”)

(6.2):

$$\begin{cases} Q = R \vee \bar{Q}; \\ \bar{Q} = S \vee Q. \end{cases}$$

(6.2)

“0”

“1”

“0,5”

“*” [44-46].

R S ()

$x(t)$

$e()$

$x(t)$

$x_1(t) (R = 1; S = 1); x_2(t) (R = 1; S = 0); x_3(t) (R = 0; S = 1);$

$: e() (R = 0; S = 0)$

$i() = x_1(t), e() (6.2.); i_2() = x_2(t), e() (6.3.)$

$i_3() = x_3(t), e() (6.4.)$

$i()$

(6.2.),

$x_1(t)$

0,

$e()$

0,5 ($Q = 0,5$ i $\bar{Q} = 0,5$).

$i()$

RS-

6.2.

R						
S						
Q						
\bar{Q}						

$x_1(t) = x_1(t), e(t)$

\bar{Q}						

6.3.

R						
S						
Q						
\bar{Q}						

$x_2(t) = x_2(t), e(t)$

6.4.

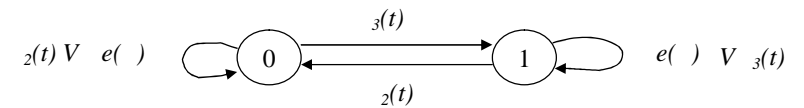
R						
S						
Q						

$x_3(t) = x_3(t), e(t)$

(.6.3.), $x_2(t)$
 $Q=0$ i $\bar{Q}=1$,
 $e(t)$
 (.6.4.), $x_3(t)$
 $Q=1$ i $\bar{Q}=0$,
 $e(t)$

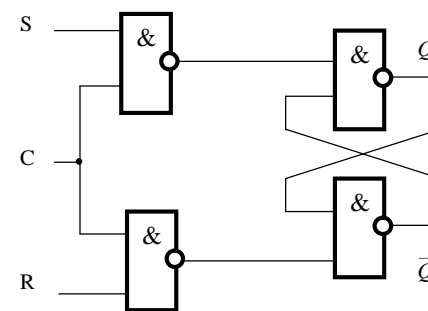
RS-

.6.2.

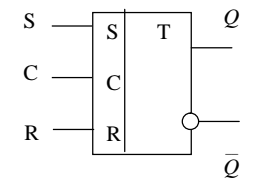


.6.2. RS-

$Q=0$,
 $Q=1$.



.6.3. RS-



.6.4. RS-

RS-

(. 6.3).

(. 6.4).

RS-

(. 3.2)

34].

$x(t)$

[1, 3, 5, 6, 8-11, 30-32,

RS-

$t,$

()

[44]

(RS-),

(, 1

2)

3 4,

(, 3 4)

1 2.

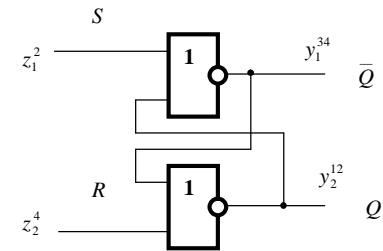
RS-

$$\begin{aligned} y_1^{34} &= \overline{y_2^{12} \vee z_1^2}; \\ y_2^{12} &= \overline{y_1^{34} \vee z_3^4}. \end{aligned} \quad (6.3)$$

RS-

. 6.5.

j



. 6.5. RS-

(, 4).

RS- (. 6.5),

$x_i(t)$

(. 6.5).

6.5.

z_i^j	x_i^j	
	x_1^2	x_2^4
z_1^2	1	0

z_2^4	0	1
---------	---	---

()

() ,

. 6.5.

$f()$

j

$z_1^2=0 \quad z_2^4=0,$

$i(Q=1 \quad \bar{Q}=0) \quad z(Q=0 \quad \bar{Q}=1).$

()

RS-

(+I)

(+I)

($z_1^2=0, z_2^4=0$).

RS-

().

6.6.

RS-

($Q=0$)

$z_1^2=1, z_2^4=0$

y_2^{12}	*	0	0	0	0	0	0
y_1^{34}	*	*	*	I	I	I	I

„*” (

6.6 6.7).

6.7.

RS-

($Q=1$)

$z_1^2=0, z_2^4=1$

y_2^{12}	*	*	*	I	I	I
y_1^{34}	*	0	0	0	0	0

RS-

RS-

RS-

RS-

D-

D-

(-),

D-

$Q(t+1)$

S R -

RS-

(. 6.1).

6.8.

D-

		Q	Q	
)	+I)		
		0	0	
		1	1	

		0	0		
		1	1		
		0	0		
		1	1		
		0	0		
		1	1		

(= 0) D-

$(Q(t)=Q(t+1)),$

D-

(= 1)

$S \quad R \quad (\quad . 6.6),$

$\bar{S} = \bar{S} \vee \bar{D} \vee \bar{C} \bar{D};$

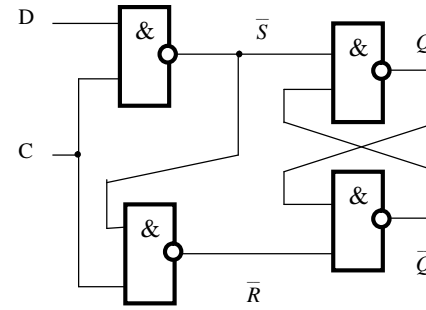
$\bar{R} = C \vee D = C \bar{D} = C \bar{D} \vee C \bar{C} = C(\bar{D} \vee \bar{C}) = C \bar{D} \bar{C}.$

n				\bar{d}
3	d			
c	(D	1	1
c	1	D	D	1
			Q	\bar{Q}

n				\bar{d}
3	d			
c	1	1	0	A
c	A	1	1	A
			Q	\bar{Q}

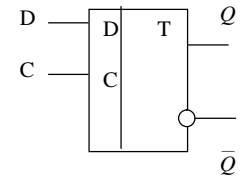
6.6.

D-



. 6.7.

D-



. 6.8. D-

T- ((2).

T- $Q(t+1)$

R-

T-

RS-

(. 6.1).

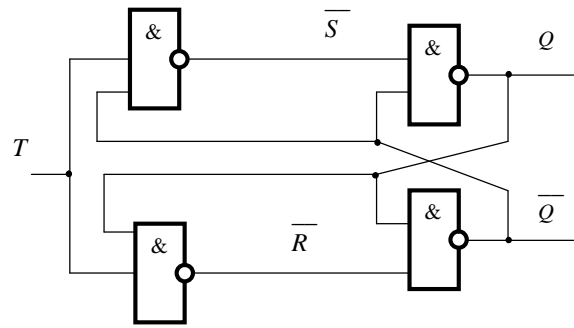
S R,

$\bar{S} = \bar{T} \vee Q;$

$\bar{R} = \bar{T} \vee \bar{Q}.$

6.9.

	Q	Q		
)	$+1)$			
	0	0		
	1	1		
	0	1		
	1	0		

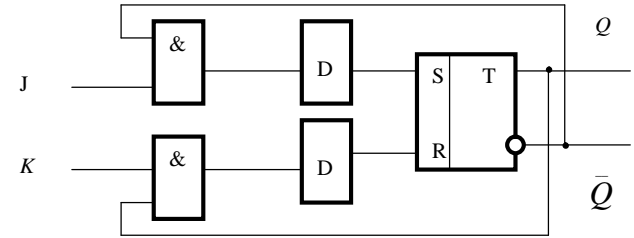


. 6.9.

6.2.

()

().



. 6.10. JK-

JK-

(. 6.9).

SR-

(. 6.7.)

$$S = J\bar{Q}; R = KQ.$$

J

D (. 6.10),

0 ($t=0$)

JK-

(. 6.12).

•

•

•

•

6.3.

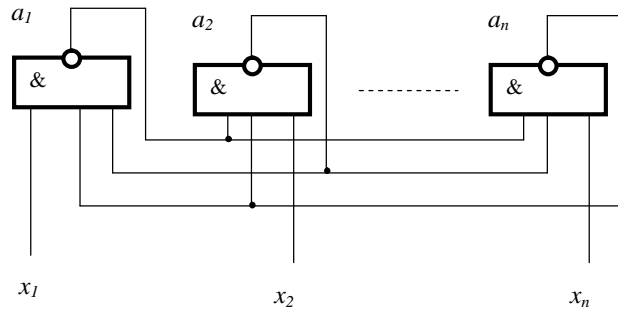
$$n = 1 + \text{int}(\log_2 K), \tag{6.4}$$

()

n

(-)

(, , n),
 , ,
 (t)
 , ,
 ()
 n) , (M < n)
 , (= n)
 . 6.13.



. 6.13.

() (. 6.13)
 RS-
 (6.10).
 6.10. , ()

x_1	x_2	---	x_n	a_1	a_2	---	a_n
0	1	---	1	1	0	---	0
1	0	---	1	0	1	---	0
--	--	---	---	--	--	---	--
1	1	---	0	0	0	---	1

$x(t)$
 (-)
 ,
 $a(t)$,
 $x(t)$. $a(t)$
 $x(t)$
 ,
 $x(t)$,
 $x(t)$

[12]:

$$M = \sum_{s=1}^n (2-1)_i = n, \tag{6.5}$$

$n-$
 r_e
 [12]:

$$r_e = \prod_{i=1}^n (2-1) = 1. \tag{6.6}$$

(M ≥ 2) , ()

$$L = \frac{n}{M}, \tag{6.13}$$

[6].

S_c

$$S_c = n(n-1) \tag{6.11}$$

$$n - \dots$$

(S_c) .

S_c

$$S_{bc} = 2n, \tag{6.12}$$

$$n - \dots$$

6

(L) .

L ,

[6]:

$n -$
 $M -$

RS- (. 6.1)

(. 6.13, . 6.14) L

$M=n$.

(r_e) .

„ ” ()

[4, 12, 15, 18-21, 26, 27, 37].

RS-

[6],

$$x_i(t) \tag{t}$$

$\{X\} \{A\}, x_i(t) \in , (t) \in .$

()

$x_i(t)$

(RS-

[6])

$x_i(t)$

()

()

(. 6.11).

6.11.

	1	2	-1	
0	1	2	-1	

$x_i(t)$,
 - (- -),
 (. 6.16), „ ” , 1
 (0), - (-) „ ” ,
 0 (1). $x_i(t)$
 - (-) ’ „ ” ,
 0 (1), -
 (-) ’ „ ”
 , .
 () .

6.4.

1. ’ ?
2. ,
3. ?
4. ’ ?
5. ?
6. ?
7. ’ ?
8. RS- - .
9. RS- - .
10. RS- (“0”, “0,5”, “1”).
11. RS-

12. RS-
13. RS-
14. RS-
15. D- .
16. D- .
17. - .
18. - - .
- 19.
20. ?
21. ?
22. JK-
23. JK-
24. JK- .
25. ?
26. ?
27. .
28. ?
29. ?
- 30.
31. .
32. - .
33. - .
34. , ’ ?

- 35. (F_p)
' ?
- 36. (ϱ)
' ?
- 37. ' (S_c) ' ?
- 38. ' (S_o) ' ?
- 39. (L) ' ?
- 40. (r_e) ' ?

7.

r_e

7.1.

$$f(j) \quad (j = \overline{1, r_e})$$

L

()
(-),

$m (m < n)$

$$y = \overline{f(a) \vee f(x) \vee f(e)}, \quad (7.1)$$

$f(a) -$

$f(j) -$

(t)

$f(j) -$

$f(j)$

(7.1.)

().

(t)

L

$(m < n)$. $(= \{1, 2, \dots, m\})$

m

$f(j)$

z_i

u_i

z_i

u_i

7.1.

()

$r_e (r_e \geq 2)$

(t)

()

j

j

$$= \dots \quad (7.3)$$

$$a(t-1) \quad (7.5)$$

$$(t) = \dots [a(t-1), (t)]. \quad (7.6)$$

$$() = \dots [a(t), a()]; a(t) = a(), \quad (7.7)$$

$$() = \dots [a()]; () = a(t) U a(). \quad (7.8)$$

$$() = \dots [a(t), e()]. \quad (7.9)$$

$$M = \sum_{l=1}^m K_l, \quad (7.10)$$

$$r_x = M + l, \quad (7.11)$$

$$(t) \quad (7.10); \quad (t) \quad (7.11)$$

$$(t), \quad (t)$$

$$r_k \quad (2 \leq k \leq m) \quad (7.12)$$

$$C_m^k - m; \quad R_i - r_e$$

$$r_e = \sum_{k=2}^m r_k. \quad (7.13)$$

$$n = 2; m = 2; R_1 = R_2 = l; M = \sum_{i=1}^2 K_i = 1+1=2; r_x = M + l = 2+1=3; r_e = l * l = 1.$$

$$L (n > m) \quad (n = m)$$

$$L = \frac{\sum_{i=1}^m R_i}{\sum_{i=1}^m (2^{R_i} - 1)}. \quad (7.14)$$

$$(7.14) \quad n = m, \quad L = 1.$$

$$(7.14) \quad n > m \quad \sum_{i=1}^m R_i < \sum_{i=1}^m (2^{R_i} - 1),$$

$L < 1$.

L

1. RS- : $n=2; m=2; R_1=R_2=1; L_1=1;$
2. : $n=8; m=2; R_1=R_2=4; L_1=0,266.$

n, m, R_i

7.2.

(7.2). m

R_i

$$R_i = \log_2(K_i + 1).$$

L

m

R_i (-),

(t) $f(t)$

() = (t), $f(t)$.

L

(-)

(=)

L

(7.16)

$$1 \left\{ \begin{array}{l} y_i = \overline{y_{p+1} \vee \dots \vee y_{p+q} \vee \dots \vee y_{k+\eta} \vee z_1 \vee u_1}; \\ \dots \\ y_p = \overline{y_{p+1} \vee \dots \vee y_{p+q} \vee \dots \vee y_{k+\eta} \vee z_p \vee u_p}; \end{array} \right.$$

$$2 \left\{ \begin{array}{l} y_{p+1} = \overline{y_1 \vee \dots \vee y_p \vee y_{p+q+1} \vee \dots \vee y_{k+\eta} \vee z_{p+1} \vee u_{p+1}}; \\ \dots \\ y_{p+q} = \overline{y_1 \vee \dots \vee y_p \vee y_{p+q+1} \vee \dots \vee y_{k+\eta} \vee z_{p+q} \vee u_{p+q}}; \end{array} \right.$$

$$m \left\{ \begin{array}{l} y_{k+1} = \overline{y_1 \vee \dots \vee y_i \vee \dots \vee y_k \vee z_{k+1} \vee u_{k+1}}; \\ \dots \\ y_{k+\eta} = \overline{y_1 \vee \dots \vee y_i \vee \dots \vee y_k \vee z_{k+\eta} \vee u_{k+\eta}}; \end{array} \right.$$

(7.16)

$$X(x \in X, x = \{z_i\}, i = \overline{(1, k + \eta)}) - (t) ;$$

$$E(e \in E, e = \{u_i\}, i = \overline{(1, k + \eta)}) - () ;$$

$$Y(Y_j \in Y, Y_j = \{y_i\}, i = \overline{(1, k + \eta)}) - () ,$$

L ;

m - (-),

(7.15),

7.1.

j (-),

j

$$L \quad (7.17)$$

$$1 \left\{ \begin{aligned} y_1 &= \overline{b_2 \vee b_3 \vee \dots \vee b_m \vee z_1 \vee u_1}; \\ \dots & \dots \\ y_1 &= \overline{b_2 \vee b_3 \vee \dots \vee b_m \vee z_p \vee u_p}; \\ b_1 &= y_1 \vee \dots \vee y_p; \end{aligned} \right.$$

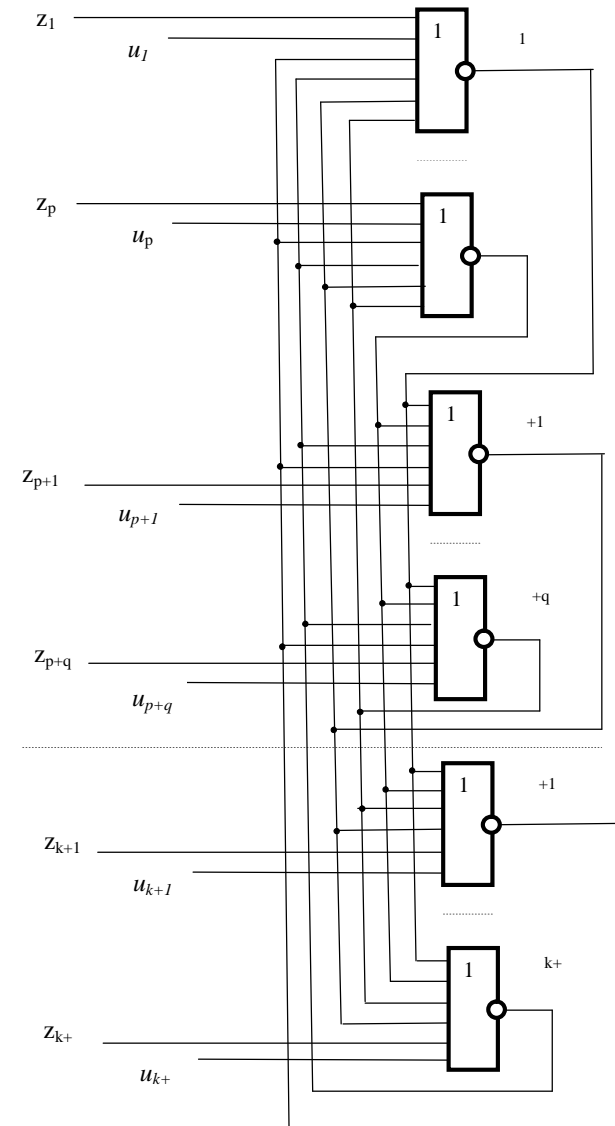
$$2 \left\{ \begin{aligned} y_{p+1} &= \overline{b_1 \vee b_3 \vee \dots \vee b_m \vee z_{p+1} \vee u_{p+1}}; \\ \dots & \dots \\ y_{p+q} &= \overline{b_1 \vee b_3 \vee \dots \vee b_m \vee z_{p+q} \vee u_{p+q}}; \\ b_2 &= y_{p+1} \vee \dots \vee y_{p+q}; \end{aligned} \right.$$

$$m \left\{ \begin{aligned} y_{k+1} &= \overline{b_1 \vee b_2 \vee \dots \vee b_{m-1} \vee z_{k+1} \vee u_{k+1}}; \\ \dots & \dots \\ y_{k+\eta} &= \overline{b_1 \vee b_2 \vee \dots \vee b_{m-1} \vee z_{k+\eta} \vee u_{k+\eta}}; \\ b_1 &= y_{k+1} \vee \dots \vee y_{k+\eta}; \end{aligned} \right.$$

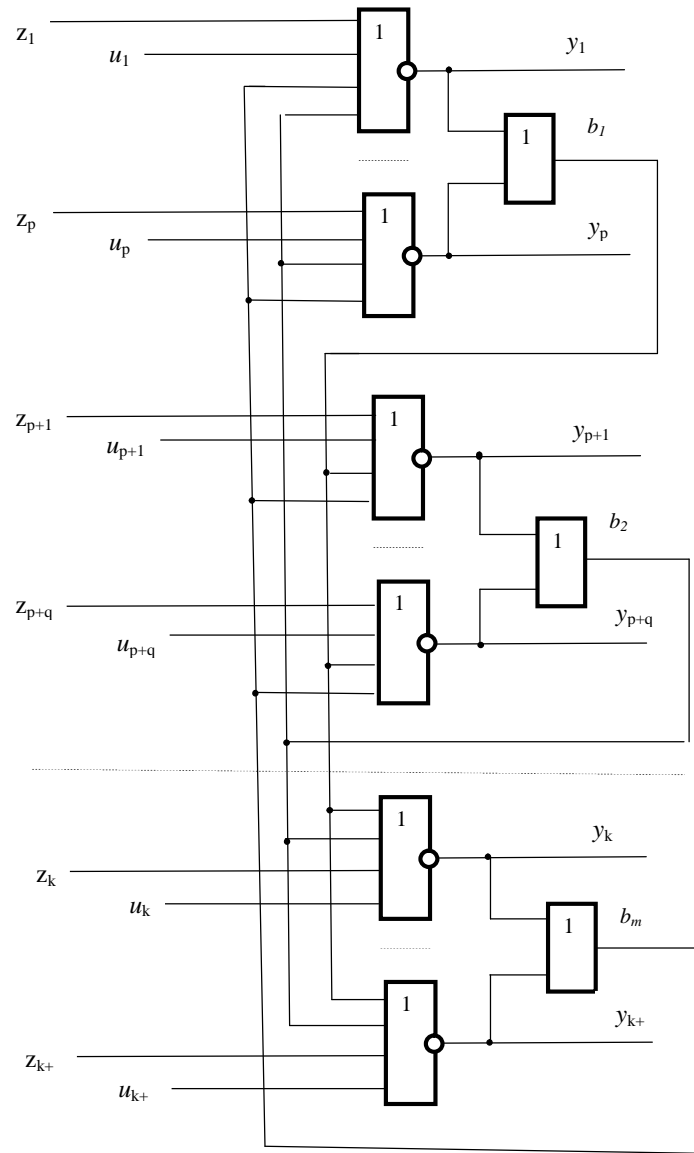
(7.17)

7.3.

$j \backslash x_i$	x_1	x_2
e_1	A_1	A_4
e_2	A_2	A_4
e_3	A_3	A_4
e_4	A_1	A_5
e_5	A_2	A_5
e_6	A_3	A_5
e_7	A_1	A_6
e_8	A_2	A_6
e_9	A_3	A_6



.7.1. L



.7.2. L^M

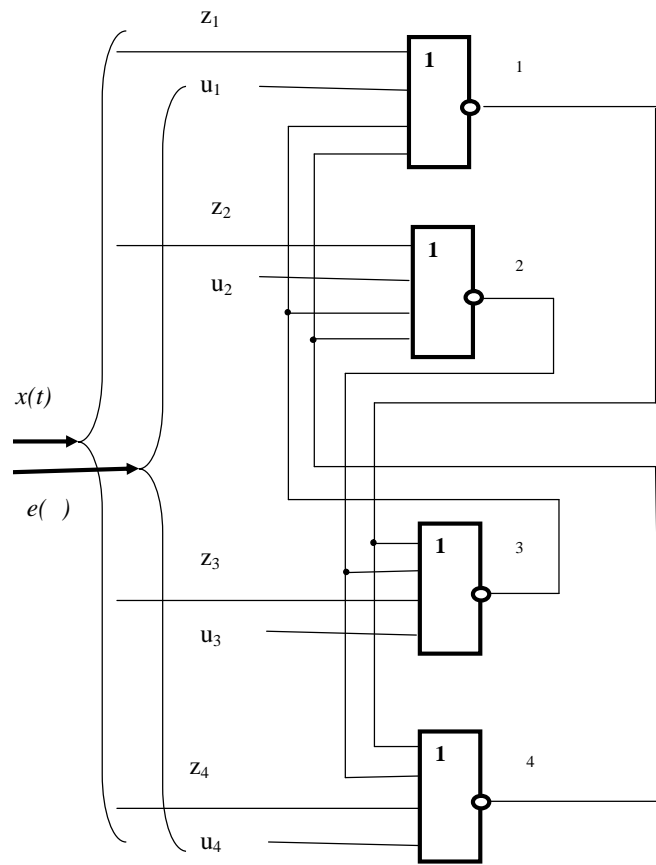
. 7.3 , L
 $(m=2)$, R
 7.15: $R_i = \log_2(3+1) = 2.$
 $(m, R_i),$
 $= (2^2-1)+(2^2-1) = 6; r_x = M+1 = 7; r_e = K_1 * K_2 = 9.$
 9 , 6 , 7

$$\begin{cases} y_1 = \overline{y_3 \vee y_4 \vee z_1 \vee u_1}; \\ y_2 = \overline{y_3 \vee y_4 \vee z_2 \vee u_2}; \end{cases}$$

$$\begin{cases} y_3 = \overline{y_1 \vee y_2 \vee z_3 \vee u_3}; \\ y_4 = \overline{y_1 \vee y_2 \vee z_4 \vee u_4}; \end{cases} \quad (7.18)$$

— $L;$
 $z_i, u_i - t$
 . 7.3. , 6 .
 $x(t)$ ()
 (.7.3.) . 7.4-7.7.
 $x(t)$
 (7.2)

. 7.4.



. 7.3.

L,

6

x(t)

(7.18),

u

t

7.4.

z_i	$x(t)$						
	x_1	x_2	x_3	x_4	x_5	x_6	x_7
z_1	1	1	1	1	1	0	0
z_2	1	1	1	1	0	1	0
z_3	1	1	0	0	1	1	1
z_4	1	0	1	0	1	1	1

1

(7.18)

:

$$\begin{cases} y_1 = \overline{y_3 \vee y_4 \vee I \vee 0}; \\ y_2 = \overline{y_3 \vee y_4 \vee I \vee 0}; \end{cases}$$

$$\begin{cases} y_3 = \overline{y_1 \vee y_2 \vee I \vee 0}; \\ y_4 = \overline{y_1 \vee y_2 \vee I \vee 0}; \end{cases}$$

($y_3 \vee y_4 \vee I \vee 0$)

o ($y_1 = y_2 = y_3 = y_4 = 0$).

2

(7.18)

:

$$\begin{cases} y_1 = \overline{y_3 \vee y_4 \vee I \vee 0}; \\ y_2 = \overline{y_3 \vee y_4 \vee I \vee 0}; \end{cases} \quad \begin{cases} y_3 = \overline{y_1 \vee y_2 \vee I \vee 0}; \\ y_4 = \overline{y_1 \vee y_2 \vee 0 \vee 0}; \end{cases}$$

1 ($y_1 = y_2 = y_3 = 0, \quad y_4 = I$).

j (. 7.5).

7.5.

L

	L				j
	y1	y2	y3	y4	
x1	0	0	0	0	0
x2	0	0	0	1	1
x3	0	0	1	0	2
x4	0	0	1	1	3
x5	0	1	0	0	4
x6	1	0	0	0	5
x7	1	1	0	0	6

$f(\cdot)$, u_i , (\cdot) , u , j , $z_i(\cdot)$, $f(\cdot)$.
 . 7.6.

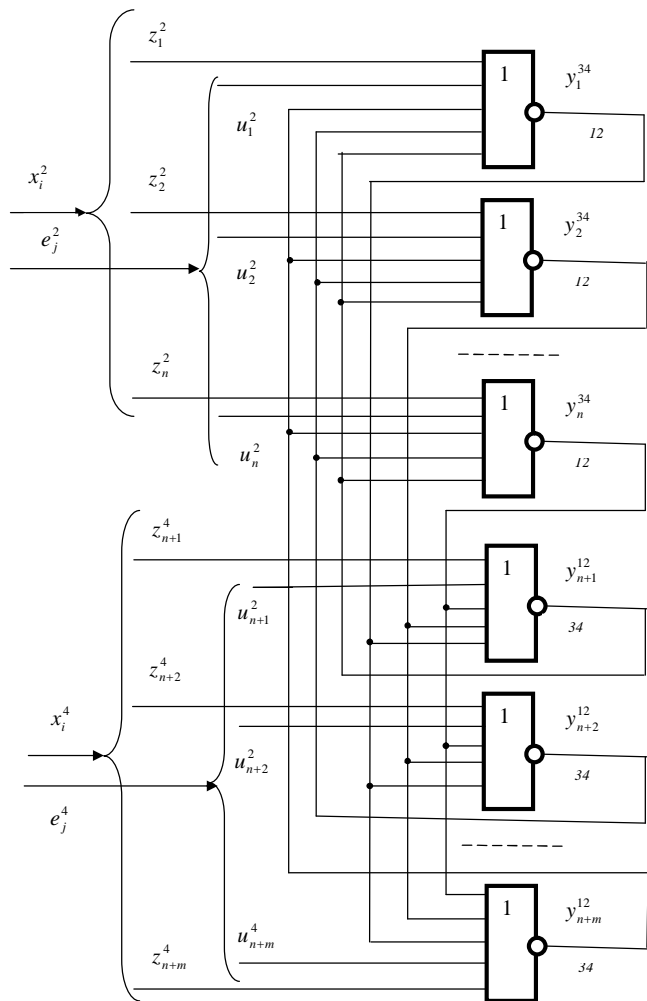
7.6.

u _i	f(·)								
	1	2	3	4	5	6	7	8	9
u ₁	1	1	1	0	0	0	0	0	0
u ₂	0	0	0	1	1	1	0	0	0
u ₃	1	0	0	1	0	0	1	0	0
u ₄	0	1	0	0	1	0	0	1	0

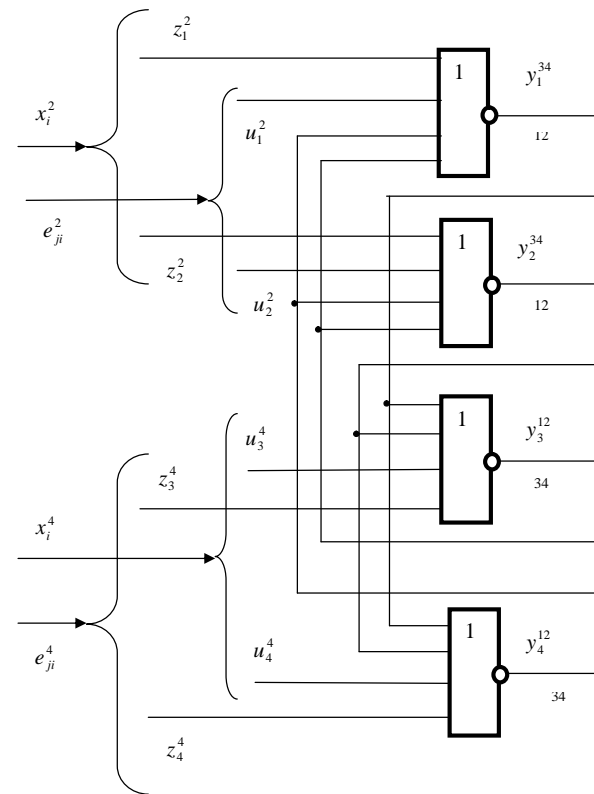
(7.18)

1 $\begin{cases} y_1 = y_3 \vee y_4 \vee 0 \vee 1; \\ y_2 = y_3 \vee y_4 \vee 0 \vee 0; \end{cases}$ 2 $\begin{cases} y_3 = y_1 \vee y_2 \vee 0 \vee 1; \\ y_4 = y_1 \vee y_2 \vee 0 \vee 0; \end{cases}$
 $1 \quad 3$
 $y_2 = \overline{y_4}$
 $y_4 = \overline{y_2}$
 $4=I$
 $2=0$, $2=I-$
 $4=0$.
 $: 1 \quad 4 (\cdot 7.5)$
 (7.17) $f(\cdot)$
 $. 7.6,$
 (7.18) $. 7.7.$
 7.7.

f(·)	f(·)
1	1, 4
2	2, 4
3	3, 4
4	1, 5
5	2, 5
6	3, 5
7	1, 6
8	2, 6
9	3, 6



.7.4.



.7.5.

.7.10

L (.7.5)

.7.11 -

.7.12 -

L,

7.9

z_i	$x_i^2 \quad x_i^4$					
	x_1^2	x_2^2	x_3^2	x_4^4	x_5^4	x_6^4
z_1^2	0	0	1	1	1	1
z_2^2	0	1	0	1	1	1
z_3^4	1	1	1	0	0	1
z_4^4	1	1	1	0	1	0

7.10.

	j				
	y_1^{34}	y_2^{34}	y_3^{12}	y_4^{12}	
x_1^2	1	1	0	0	1
x_2^2	1	0	0	0	2
x_3^2	0	1	0	0	3
x_4^4	0	0	1	1	4
x_5^4	0	0	1	0	5
x_6^4	0	0	0	1	6

7.11.

	j								
	1	2	3	4	5	6	7	8	9
u_1^2	0	0	1	0	0	0	0	1	1
u_2^2	0	1	0	0	0	1	1	0	0
u_3^4	0	0	0	0	1	1	0	0	0

z_4^4	0	0	0	1	0	0	1	0	1
---------	---	---	---	---	---	---	---	---	---

7.12.

j	L,	
1	1	4
2	2	4
3	3	4
4	1	5
5	2	5
6	3	5
7	1	6
8	2	6
9	3	6

RS- ,
 () ,
 (+I)
 $j(+I)$
 j
 7.12.
 L ,
 L

(-)

:

•

•

•

•

•

•

•

$$R_i (R_i=2, 3, \dots, \frac{K}{2})$$

$$R_i = \frac{K}{2}; K \leq P_1:$$

$$M_{\max} = \sum_{i=1}^m (2^{R_i} - 1) = \sum_{i=1}^2 (2^{\frac{K}{2}} - 1) = 2 * (2^{\frac{K}{2}} - 1). \quad (7.21)$$

$$L^M - (-)$$

$$(R_i=2, 3, \dots, R), n < 2; m = -1; R_i=R; n=m*R; K \leq P_1:$$

$$M_{\max} = \sum_{i=1}^m (2^{R_i} - 1) = \sum_{i=1}^{K-1} (2^{R_i} - 1). \quad (7.22)$$

$$4- (155 1)$$

$$1(i=10) (155 4)$$

$$2(2=10).$$

$$m L (7.21):$$

$$M_{\max} = \sum_{i=1}^m (2^{R_i} - 1) = 2 * (2^2 - 1) = 2 * 3 = 6.$$

(7.22):

$$M_{\max} = \sum_{i=1}^m (2^{R_i} - 1) = \sum_{i=1}^3 (2^{R_i} - 1) = 21.$$

,

$$L L .$$

$$(.6.14)[22],$$

L F

$$(5.7): F = 1/2 , -$$

$$() L$$

$$F = 1/3 ,$$

(7.23)

$$L 3_e$$

$$F_p$$

$$()$$

$$(5.8) F_p \leq 1/4_e,$$

$$L .$$

$$L$$

$$2_e,$$

$$L$$

$$F_p \leq 1/6 \quad (7.24)$$

$$F \quad L \quad (6.7) - (6.8),$$

$$L - \quad (6.21) - (6.22),$$

(.3.4),

(ϱ). L

[22]:

$$P_Q = P_e - R_i = P_e - \frac{K}{2}; (P_Q \geq 1; P_1 \geq \frac{K}{2}; R_i = \frac{K}{2}), \quad (7.25)$$

$$R_i - \quad (= 1, 2) \quad [22]: \quad (7.26)$$

$$155 \quad 1 \quad (4 -) \quad 155 \quad (3)$$

$$P_Q = P_e - \frac{K}{2} = 10 - 2 = 8.$$

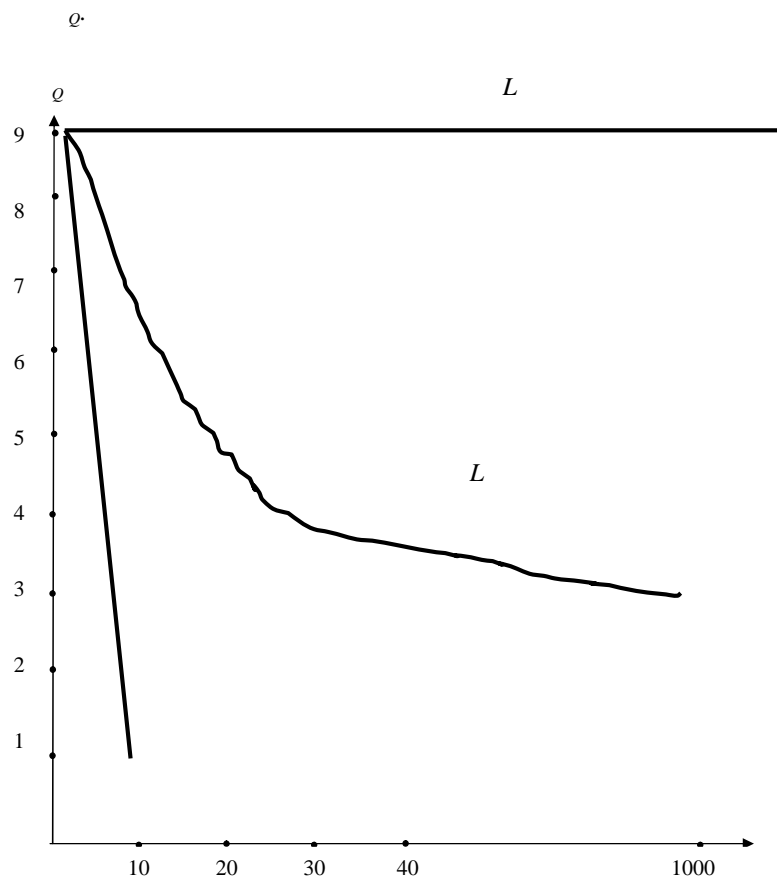
$$P_Q = P_e - 1 = 10 - 1 = 9.$$

$$(m \quad 4 \quad 21)$$

$$(.7.6)$$

$$()$$

L , $()$



.7.6.

$$S_c = m * R_i * (n - R_i), \quad (7.27)$$

$$n - \quad (-), \quad ;$$

$$R_i - \quad (-) -$$

$$L \quad S_c \quad :$$

$$S_c = n + m \cdot R_i \cdot (m - 1), \quad (7.28)$$

$$n - \dots - (\dots), \quad ;$$

$$m(m < n) - \dots - (\dots)$$

$$S_c \quad m$$

n

$$10 (n = 10)$$

$$(\dots) S_c$$

$$(6.10) \quad S_c :$$

$$S_c = n \cdot (n - 1) = 10 \cdot 9 = 90, \quad = n = 10.$$

$$L \quad m = 2, R_i = 5 :$$

$$S_c = m \cdot R_i \cdot (n - R_i) = 2 \cdot 5 \cdot 5 = 50,$$

$$M_{\max} = \sum_{i=1}^m (2^{R_i} - 1) = 2 \cdot (2^5 - 1) = 2 \cdot 31 = 62.$$

$$L \quad m = 2, R_i = 4, n = 8 (\dots)$$

:

$$S_c = n + m \cdot R_i \cdot (m - 1) = 8 + 2 \cdot 4 \cdot 1 = 16,$$

$$M_{\max} = \sum_{i=1}^m (2^{R_i} - 1) = \sum_{i=1}^2 (2^4 - 1) = 2 \cdot 15 = 30.$$

S_c

. 7.7.

(. 7.7.)

S_c

()

()

S_c

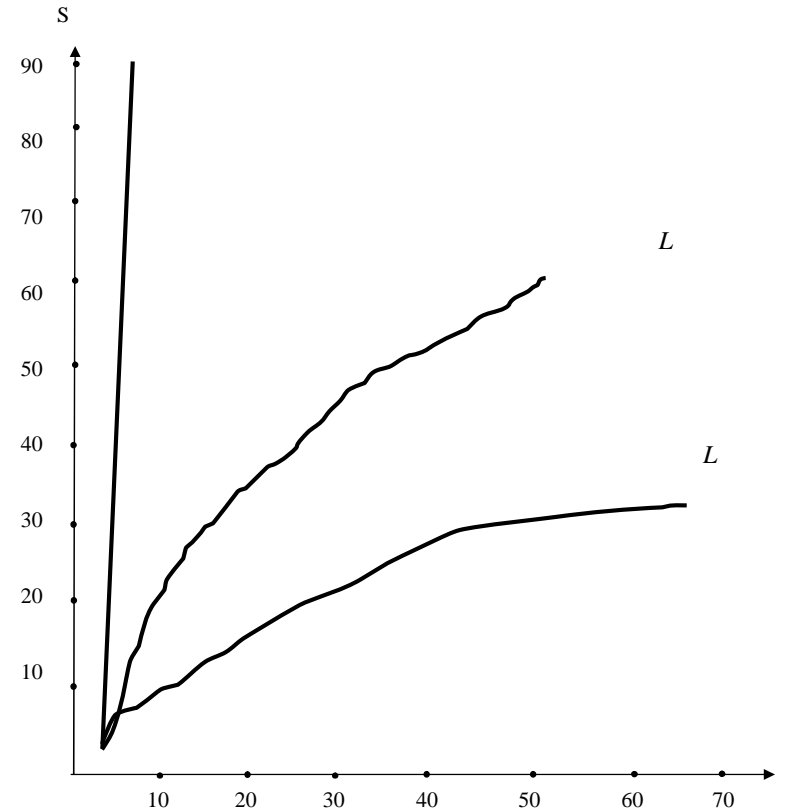
L

(S_c).

S_c

$$(6.11) \quad S_c = 2n, \quad (\dots)$$

$$2n (S_c < 2n).$$



. 7.7.

$$6$$

$$12 (5.11),$$

$$6$$

$$- 8 (. 7.3).$$

S_c

(. 5.1)
6.13)

L ,
 L

(L).

[6],

$$L = \frac{\sum_{i=1}^m R_i}{\sum_{i=1}^m (2^{R_i} - 1)},$$

L L

$$L = \frac{m + \sum_{i=1}^m R_i}{\sum_{i=1}^m (2^{R_i} - 1)}.$$

L

$n=4; m=2; R_i=2;$

$$L_1 = \frac{4}{6} = \frac{2}{3} \approx 0,6(6);$$

$n=6; m=2; R_i=3;$

$$L_2 = \frac{6}{14} = \frac{3}{7} \approx 0,428;$$

$n=8; m=2; R_i=4;$

$$L_3 = \frac{8}{30} = \frac{4}{15} \approx 0,26(6);$$

$n=10; m=2; R_i=5;$

$$L_4 = \frac{10}{62} = \frac{5}{31} \approx 0,16;$$

L

$n=4+2; m=2; R_i=2;$

$$L_1 = \frac{6}{6} = 1;$$

$n=6+2; m=2; R_i=3;$

$$L_2 = \frac{8}{14} = \frac{4}{7} \approx 0,57;$$

$n=8+2; m=2; R_i=4;$

$$L_3 = \frac{10}{30} = \frac{1}{3} \approx 0,3(3);$$

$n=10+2; m=2; R_i=5;$

$$L_4 = \frac{12}{62} = \frac{6}{31} \approx 0,193;$$

L

. 7.8.

(. 6.12, .

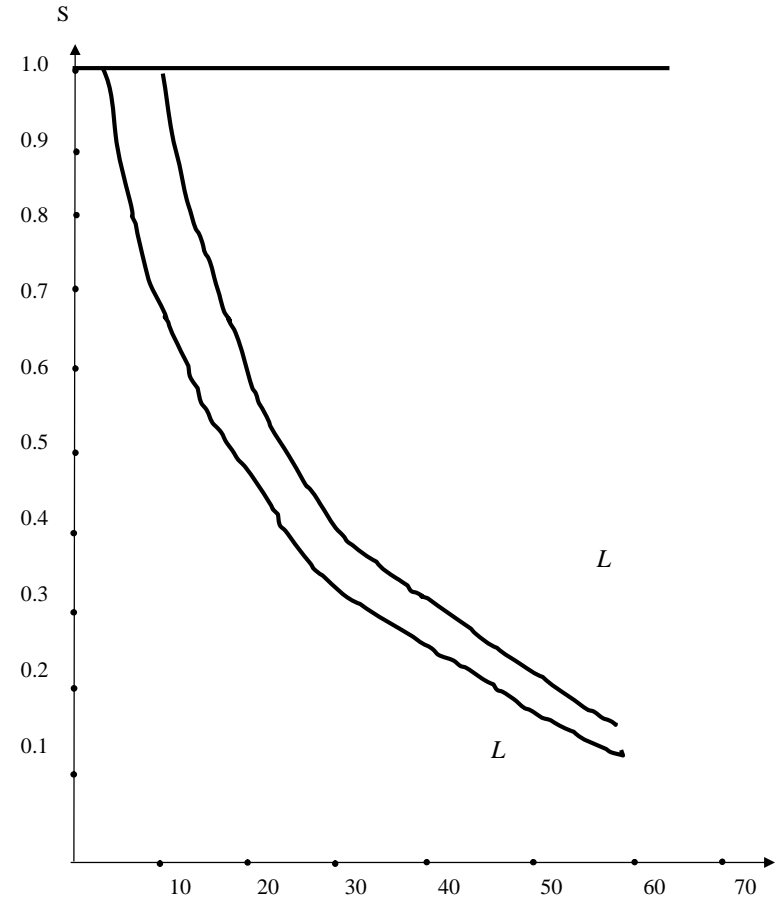
RS-

$M=n$.

:

(7.27)

(7.28)



. 7.8.

(r_e).

z_i

Z

(. 7.3).

[3, 6, 8, 11, 29-32, 39]
 (t) (t)
 $f()$,
 $\{X\} \xrightarrow{e_j} \{A\}$, j ,
 j [12].
 $(. 7.3)$, z_1
 z_2 , z_1 , z_3 z_4 $()$
 $z_2 (. 7.9)$.
 (t) . 7.13,

$j()$. 7.14.

ij
 $a()$,
 (t) $j()$ $(a() = (t), j())$.
 7.13. (t)

z	z_1	z_2
o	0	0
i	0	1
s	1	0

7.14.

$j()$

u_i									
u_1	0	0	0	1	1	1	1	1	1
u_2	1	1	1	0	0	0	1	1	1
u_3	0	1	1	0	1	1	0	1	1
u_4	1	0	1	1	0	1	1	0	1

7.15

o ,

o

“ ” ,
 , “ ”
 , 7.14 , $j()$
 (t)
 ij ,

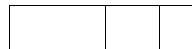
$\{X\} \xrightarrow{e_j} \{a\}$

j

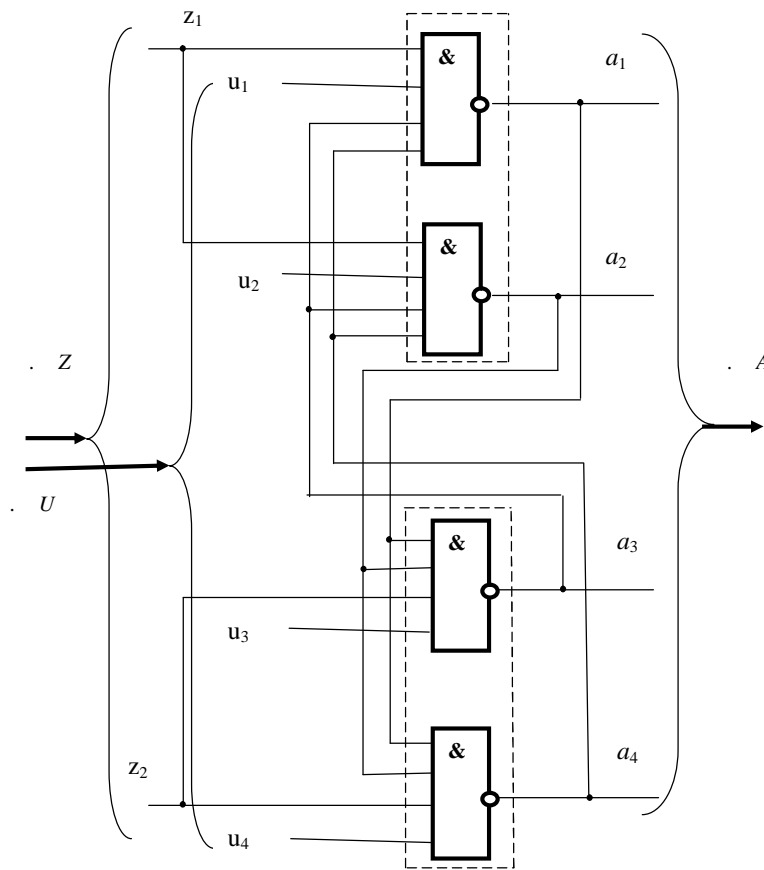
$(. 7.9)$. 7.15.

7.15.

j		
1		
2		
3		
4		
5		
6		
7		
8		
9		



μ , $j ()$
 (\in) $s (s \in ; j , s \in \mu)$
 $j ()$,



. 7.9. , Z , 155

[10, 11] [6]
 $o ()$
 $\{X\} \xrightarrow{e_j} \{a\}$

$j()$, [4, 15, 26, 27, 31, 37],

$j()$, (. 4.6), (. 4.7) (. 4.8) (. 3.4),

7.16.

		L	L ^M	
M_{max}	8	30	90	L ^M
F_p	12,5 M	12,5 M	10 M	L
P_Q	3	6	9	L ^M
S (=28)	756	18	12	L ^M
L (=28)	1	0,2	0,3	L
r_e	1	3	3	L L ^M

RS-

j , [1, 3, 8-11, 30-32, 37, 39], [6]

7.3.

7.1.

$a()$

$a()$,

(t)

$j()$

(. 7.3.)

7.5. 7.7.

(t) $j()$

(t)

. 7.5.,

$j()$

. 7.7.

$a()$

r_p

$a()$

:

$$r_{p_k} = k * r_k; \tag{7.29}$$

(7.29)

$$r_p = \sum_{k=2}^m r_{p_k}, \tag{7.30}$$

(7.30)

(2 ≤ k ≤ m) -

$j()$

;

$r_k -$

$j()$

;

$m -$

(. 7.3)

r

$j()$

9.

$j()$

(. 7.7).

(7.30)

$a()$

=2 $r_k=9$,

$a()=18$.

$a()$

. 7.17.

7.17.

$o(\cdot)$

$o(\cdot)$			
p_1	x_2	e_1	A_1
p_2	x_5	e_1	A_4
p_3	x_5	e_2	A_4
p_4	x_3	e_2	A_2
p_5	x_5	e_3	A_4
p_6	x_4	e_3	A_3
p_7	x_6	e_4	A_5
p_8	x_2	e_4	A_1
p_9	x_6	e_5	A_5
p_{10}	x_3	e_5	A_2
p_{11}	x_6	e_6	A_5
p_{12}	x_4	e_6	A_3
p_{13}	x_7	e_7	A_6
p_{14}	x_2	e_7	A_1
p_{15}	x_7	e_8	A_6
p_{16}	x_3	e_8	A_2
p_{17}	x_7	e_9	A_6
p_{18}	x_4	e_9	A_3

$o(\cdot)$

t

(7.2),

(7.3),

$o(\cdot)$

()

)

—

2

(7.6)

,

$f(\cdot)$

2 (

t

()

$o(\cdot)$.

$f(\cdot)$

9

RS-

j

(.7.10).

(.7.3)

7.4.

()

$o(\cdot)$,

μ

7.2.

()

(),

(t)

$f(\cdot)$

()

μ

(, $\in \mu$).

(. 7.3)

. 7.5 7.7

(t) $f(\cdot)$

(t)

. 7.5,

$1 / 2$,

$f(\cdot)$

. 7.7

()

μ

(, $\in \mu$)

$1 / 2$.

()

$2, 2,$

$2(t)$

$1(t)$,

$2(\cdot)$

$1(t)$

$2(\cdot)(1 2)$

(7.5).

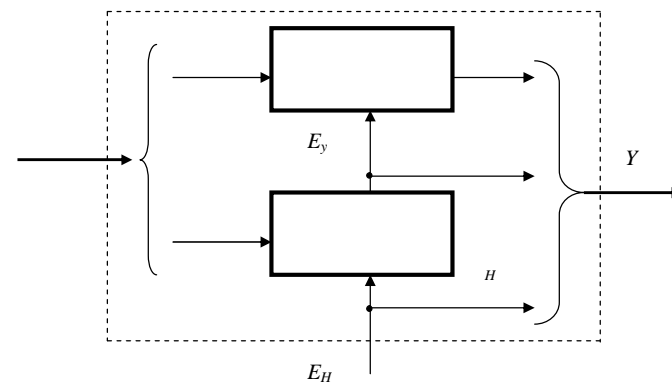
- 22. , ?
- 23. R_i - , ?
- 24. $L?$
- 25. L ?
- 26. .
- 27. .
- 28. $x(t)$?
- 29. $f()$?
- 30. .
- 31. .
- 32. max , ?
- 33. (F_p)
- 34. (ϱ) ?
- 35. (S_c) ?
- 36. (S_o) ?
- 37. (L) ?
- 38. (r_e) ?

8.

8.1.

() , () ,
 :
 • - , R_i ($R_i > 1$),
 ($= 1, 2, \dots, -1$);
 • ($= 1, 2, \dots, N$)
 $x_i(t)$
 $e_j(\)$
 $x_i(t)$, μ
 $e_j(\)$

8.1.

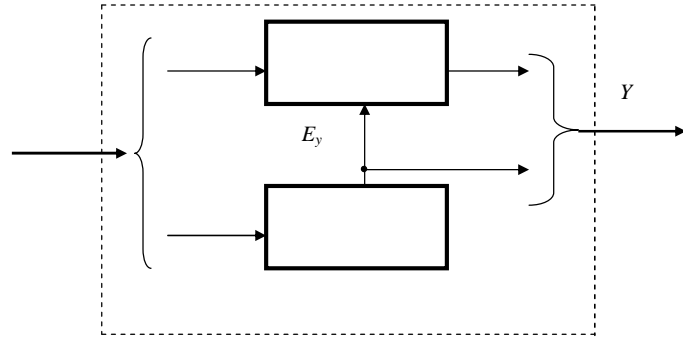


. 8.1.

8.2.

Y

. 8.2.



. 8.2.

8.2.

$$r_e = f(j)$$

(7.13),

$$r_e = f(j)$$

$$f(j)$$

$$r_e = 10 \quad (r_e < 10)$$

(. 6.12),

$$(7.4): = 2^l - 1 = 1.$$

$$(7.10). M = \sum_{i=1}^m K_i,$$

$$r_e = f(j)$$

$$(7.12). r_e = \prod_{i=1}^M K_i = 1^M = 1.$$

$$r_e = f(j)$$

$$r_e =$$

9

$$9 = f(j)$$

. 8.3.

. 8.3.

(t)

. 8.1.

8.1.

(t)

z_j	(t)									
	1	2	3	4	5	6	7	8	9	0
z_1	0	1	1	1	1	1	1	1	1	1
z_2	1	0	1	1	1	1	1	1	1	1
z_3	1	1	0	1	1	1	1	1	1	1
z_4	1	1	1	0	1	1	1	1	1	1
z_5	1	1	1	1	0	1	1	1	1	1
z_6	1	1	1	1	1	0	1	1	1	1
z_7	1	1	1	1	1	1	0	1	1	1
z_8	1	1	1	1	1	1	1	0	1	1
z_9	1	1	1	1	1	1	1	1	0	1

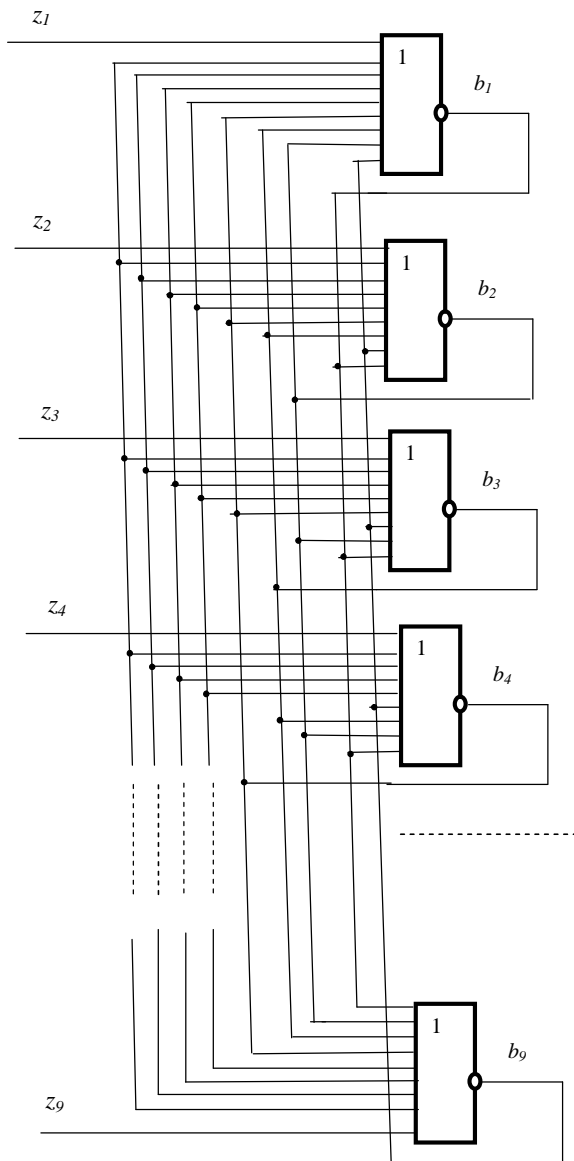
(. 8.3) $z_j (z_1 = z_2 = z_3 = z_4 = z_5 = z_6 = z_7 = z_8 = z_9 = 0)$,

(. 8.2.), 8.2.

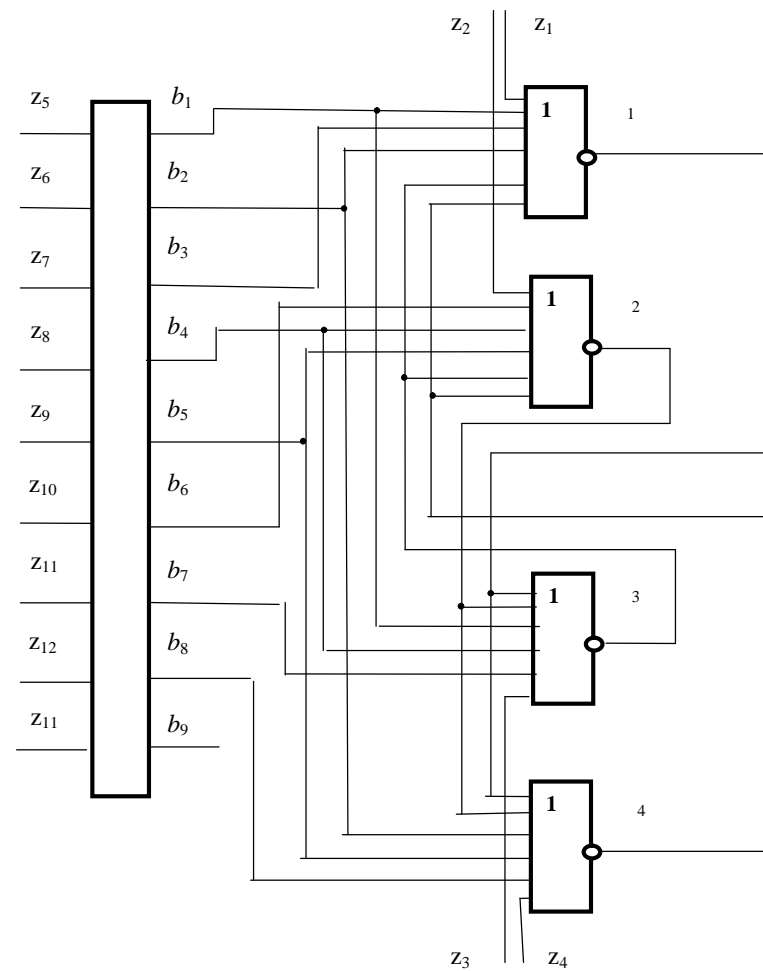
(t)	$b(\cdot)$									
	b_1	b_2	b_3	b_4	b_5	b_6	b_7	b_8	b_9	
0	0	0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0	0	1
2	0	1	0	0	0	0	0	0	0	2
3	0	0	1	0	0	0	0	0	0	3
4	0	0	0	1	0	0	0	0	0	4
5	0	0	0	0	1	0	0	0	0	5
6	0	0	0	0	0	1	0	0	0	6
7	0	0	0	0	0	0	1	0	0	7
8	0	0	0	0	0	0	0	1	0	8
9	0	0	0	0	0	0	0	0	1	9

0 () , (. 7.12) $r_e (r_{e-})$ $j(\cdot)$

8.3. (. 8.2.) $j(\cdot)$ $b_j(T)$ (. 6.1), (. 8.3), $b_j(T)$ $j(\cdot)$ $b_j(T)$ (. 8.3) (. 8.4).



. 8.3.



. 8.4.

$i()$ u_i
 $: u_1=1; u_2=0; u_3=1; u_4=0.$
 $u_1 \quad u_3 \quad b_1$

1 3

b_j
 i , b_9
 $g()$
 u_i : $u_1=0$;
 $u_2=0; u_3=0; u_4=0$.

. 8.4.

$$r_c = r_e - I \quad (8.1)$$

$$r_e - I() \quad (7.13).$$

(. 8.4)

(t) , (t) .
 (t) , $(t) -$
 j .
 $()$ 2 .
 (t) (t) .
 2 , $()$ $f()$
 (t) $f()$.
 (t) ,

m ,
 $f()$.
 $z_i(=1, 2, 3, 4)$ (. 8.4)
 8.3 , (t)
 $z_1(z_1= z_2=1; z_3= z_4=0)$, $z_2(z_1= z_2=0; z_3= z_4=1)$, $z_3(z_1= z_2=$
 $z_3= z_4=1)$.

8.3. (t)

	(t)																	
z_i	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}
z_1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
z_2	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
z_3	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
z_4	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
z_5	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1
z_6	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1
z_7	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1
z_8	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1
z_9	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1
z_{10}	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1
z_{11}	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1
z_{12}	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1
z_{13}	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0

11.

(t)
 z_i , z_1, z_2, z_3, z_4
 (t)
 . 8.3.
 (t)
 r_p^2
 m r_e $f()$
 $r_p^2 = m_y r_e$ (8.2)
 $(z_i=0)$
 (t)
 . 8.4.

8.4.

x														
	b_1	b_2	b_3	b_4	b_5	b_6	b_7	b_8	b_9	1	2	3	4	
x_1	1	0	0	0	0	0	0	0	0	0	0	0	1	1
x_2	0	1	0	0	0	0	0	0	0	0	0	1	0	2
x_3	0	0	1	0	0	0	0	0	0	0	0	1	1	3
x_4	0	0	0	1	0	0	0	0	0	0	0	0	1	4

x_5	0	0	0	0	1	0	0	0	0	0	0	1	0	5
x_6	0	0	0	0	0	1	0	0	0	0	0	1	1	6
x_7	0	0	0	0	0	0	1	0	0	0	0	0	1	7
x_8	0	0	0	0	0	0	0	1	0	0	0	1	0	8
x_9	0	0	0	0	0	0	0	0	10	0	0	1	1	9
x_{10}	1	0	0	0	0	0	0	0	0	0	1	0	0	10
x_{11}	0	1	0	0	0	0	0	0	0	0	1	0	0	11
x_{12}	0	0	1	0	0	0	0	0	0	0	1	0	0	12
x_{13}	0	0	0	1	0	0	0	0	0	1	0	0	0	13
x_{14}	0	0	0	0	1	0	0	0	0	1	0	0	0	14
x_{15}	0	0	0	0	0	1	0	0	0	1	0	0	0	15
x_{16}	0	0	0	0	0	0	1	0	0	1	1	0	0	16
x_{17}	0	0	0	0	0	0	0	1	0	1	1	0	0	17
x_{18}	0	0	0	0	0	0	0	0	1	1	1	0	0	18

L

L 0,7,

(. 8.4)

18 ()

18 18 18

18

(. 8.4) 13 11

13 ()

18 $17*18=306,$ (. 7.4)

$20+8*9=92$

8.4.

()

100%

100%

j ()

Q

()

(155)

$2R \quad 2R-1, \quad R-$

()

$$L_N, \quad N=3, \quad (\quad)$$

$$P_1, R- \quad (\quad)$$

$$P_2, J- \quad (\quad)$$

$$P_3, \quad J < \quad , \quad < M, R < M, P1 < M, P2 < M,$$

$P3 < M.$

$$K_{\min} = m_j - 1 + 2^{R_{j,i-1}};$$

$$R_{\min} = R_{j,i};$$

$$J_{\min} = N - 3;$$

$$P_{1\min} = \sum_{i=1}^{j-1} (2^{R_{j,i-1}} - 1) + m_j;$$

$$P_{2\min} = \sum_{i=1}^{m_j-1} R_{j,i} + \sum_{i=1}^{j-1} (2^{R_{j,i-1}} - 1);$$

$$P_{3\min} = n_j - m_j.$$

$$R_i (R_i=2, 3, \dots, \frac{K}{2})$$

$$m, \quad n = \quad ; \quad m=2; \quad R_i = \frac{K}{2}; \quad K \leq P_1$$

$$M_{\max} = \sum_{i=1}^m (2^{R_i} - 1) = \sum_{i=1}^2 (2^{\frac{K}{2}} - 1) = 2 * (2^{\frac{K}{2}} - 1).$$

$$L^M \quad - \quad (\quad)$$

$$m, \quad R-$$

$$(\quad) \quad 2$$

$$R_i (R_i=2, 3, \dots,$$

$$R), n < \quad 2; \quad m = \quad -1; \quad R_i = R; \quad n = m * R; \quad K \leq P_1$$

$$M_{\max} = \sum_{i=1}^m (2^{R_i} - 1) = \sum_{i=1}^{K-1} (2^{R_i} - 1).$$

$$4- \quad (155 \quad 1)$$

$$1 \quad (\quad i=10) \quad (155 \quad 4)$$

$$2 \quad (\quad 2=10).$$

$$M_{\max} = \sum_{i=1}^m (2^{R_i} - 1) = 2 * (2^2 - 1) = 2 * 3 = 6.$$

$$M_{\max} = \sum_{i=1}^m (2^{R_i} - 1) = \sum_{i=1}^3 (2^{R_i} - 1) = 21.$$

[22],

$L F$

$$(5.7): \quad F = 1/2 \quad ,$$

$$(\quad) \quad L$$

$$F = 1/3 \quad ,$$

$L \quad 3 \quad e$

F_p

$$(5.8) F_p \leq 1/4 e, \quad L$$

$$F_p \leq 1/6 e$$

$$(5.7) - (5.8),$$

$$(5.21) - (5.22),$$

(.3.4),

$$P_Q = P_e - R_i = P_e - \frac{K}{2}; (P_Q \geq 1; P_i \geq \frac{K}{2}; R_i = \frac{K}{2}), \quad (8.3)$$

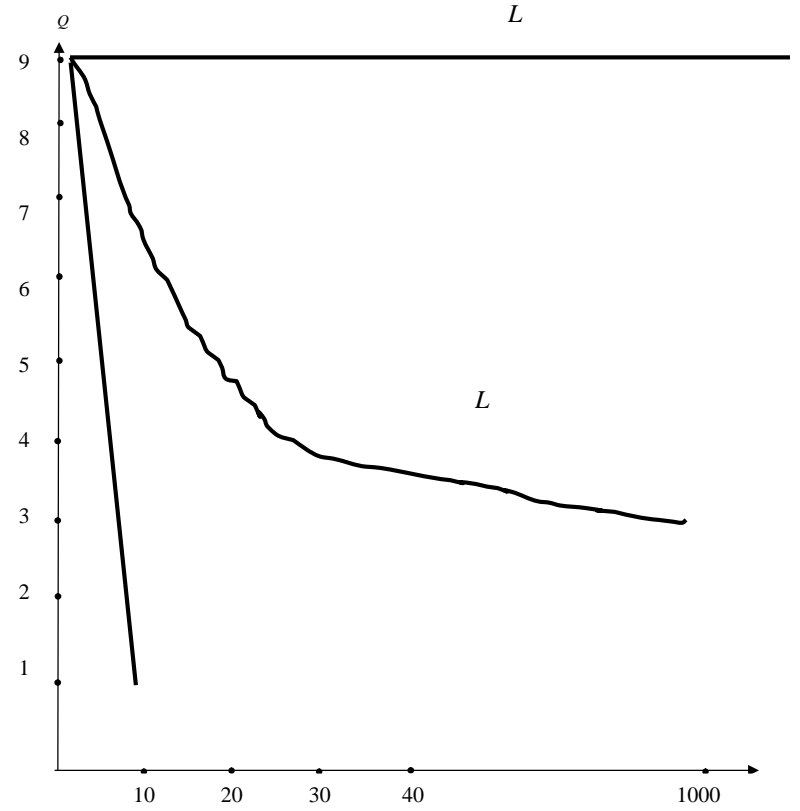
$$R_i - L \quad \varrho = n_e - 1 \quad [22]: \quad (8.4)$$

$$155 \quad 1 \quad (4 -) \quad 155 \quad (3)$$

$$P_Q = P_e - \frac{K}{2} = 10 - 2 = 8.$$

$$P_Q = P_e - 1 = 10 - 1 = 9.$$

.8.4.



.8.4.

(.8.4.)

()

()

L , ()

Q

$$S_c = m \cdot R_i \cdot (n - R_i) \quad (8.5)$$

$$S_c = n + m \cdot R_i \cdot (m - 1) \quad (8.6)$$

$$M_{\max} = \sum_{i=1}^m (2^{R_i} - 1) = 2 \cdot (2^5 - 1) = 2 \cdot 31 = 62.$$

$$(6.10) \quad S_c :$$

$$S_c = n \cdot (n - 1) = 10 \cdot 9 = 90, \quad n = 10.$$

$$L \quad m=2, R_i=5 :$$

$$S_c = m \cdot R_i \cdot (n - R_i) = 2 \cdot 5 \cdot 5 = 50,$$

$$M_{\max} = \sum_{i=1}^m (2^{R_i} - 1) = 2 \cdot (2^5 - 1) = 2 \cdot 31 = 62.$$

$$L \quad m=2, R_i=4, n=8 (\quad - \quad)$$

:

$$S_c = n + m \cdot R_i \cdot (m - 1) = 8 + 2 \cdot 4 \cdot 1 = 16,$$

$$M_{\max} = \sum_{i=1}^m (2^{R_i} - 1) = \sum_{i=1}^2 (2^4 - 1) = 2 \cdot 15 = 30.$$

$$S_c$$

. 8.5.

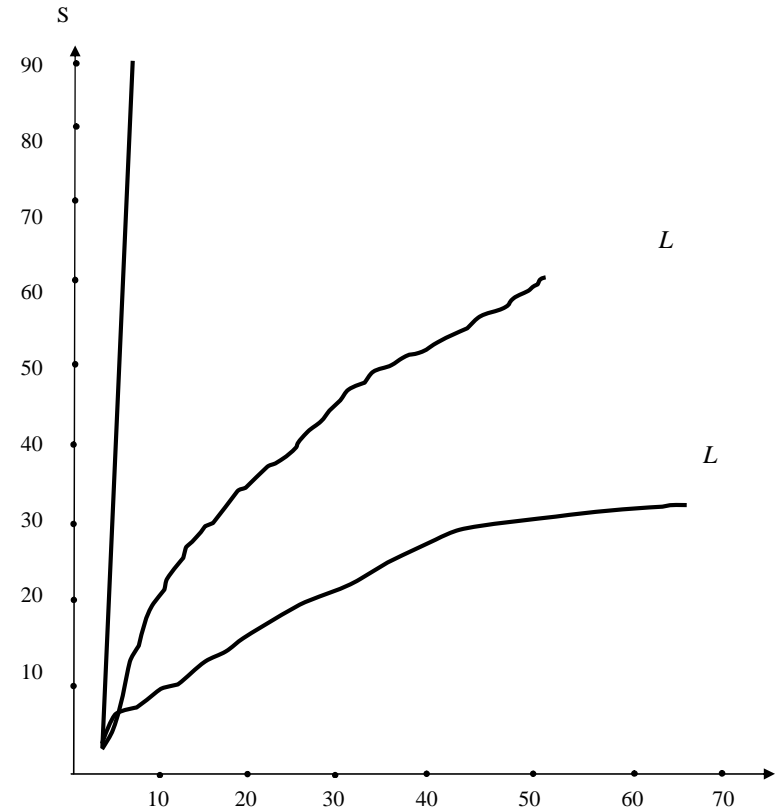
(. 8.5.)

()

()

S_c

L ,



. 8.5.

(S_c).

S_c

$$(6.11) \quad S_c = 2n, \quad (\quad)$$

$$2n \quad (S_c < 2n).$$

6

6

S_c

12 (. 6.12),

- 8 (. 8.3).

(6.1)
6.13)

L ,
 L

(L).

[6],

$$L = \frac{\sum_{i=1}^m R_i}{\sum_{i=1}^m (2^{R_i} - 1)},$$

L

L

$$L = \frac{m + \sum_{i=1}^m R_i}{\sum_{i=1}^m (2^{R_i} - 1)}.$$

L

$n=4; m=2; R_i=2;$

$L_1 = \frac{4}{6} = \frac{2}{3} \approx 0,6(6);$

$n=6; m=2; R_i=3;$

$L_2 = \frac{6}{14} = \frac{3}{7} \approx 0,428;$

$n=8; m=2; R_i=4;$

$L_3 = \frac{8}{30} = \frac{4}{15} \approx 0,26(6);$

$n=10; m=2; R_i=5;$

$L_4 = \frac{10}{62} = \frac{5}{31} \approx 0,16;$

L

$n=4+2; m=2; R_i=2;$

$L_1 = \frac{6}{6} = 1;$

$n=6+2; m=2; R_i=3;$

$L_2 = \frac{8}{14} = \frac{4}{7} \approx 0,57;$

$n=8+2; m=2; R_i=4;$

$L_3 = \frac{10}{30} = \frac{1}{3} \approx 0,3(3);$

$n=10+2; m=2; R_i=5;$

$L_4 = \frac{12}{62} = \frac{6}{31} \approx 0,193;$

L

. 8.6.

RS-

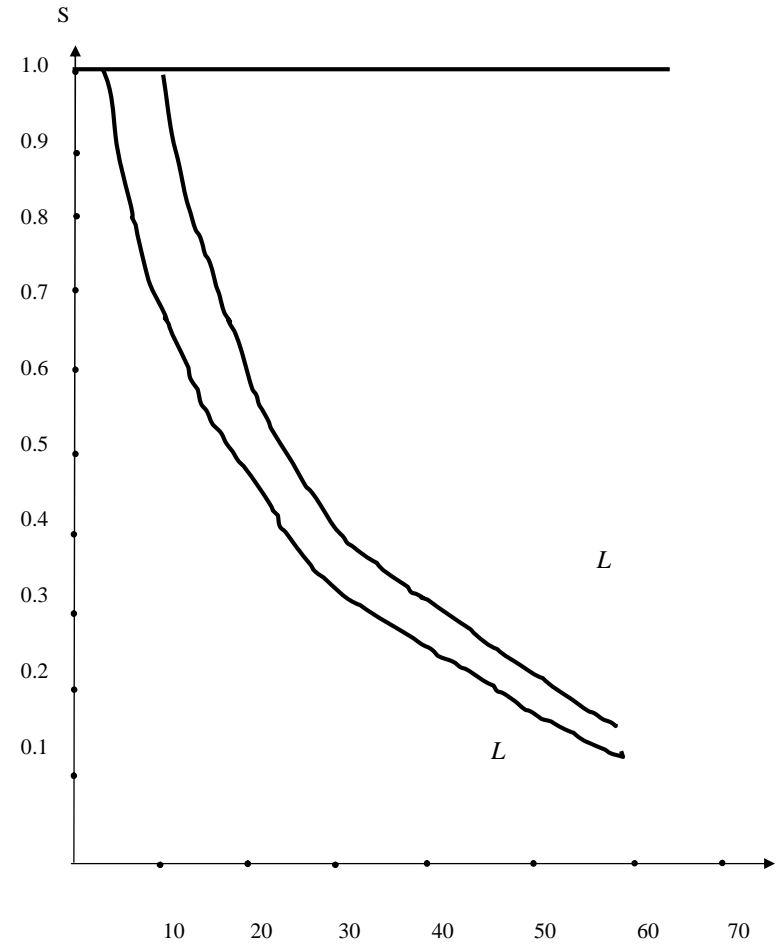
(6.12, .

, $M=n$.

:

(8.7)

(8.8)



. 8.6.

z_i

(r_e).

Z

(.7.2).

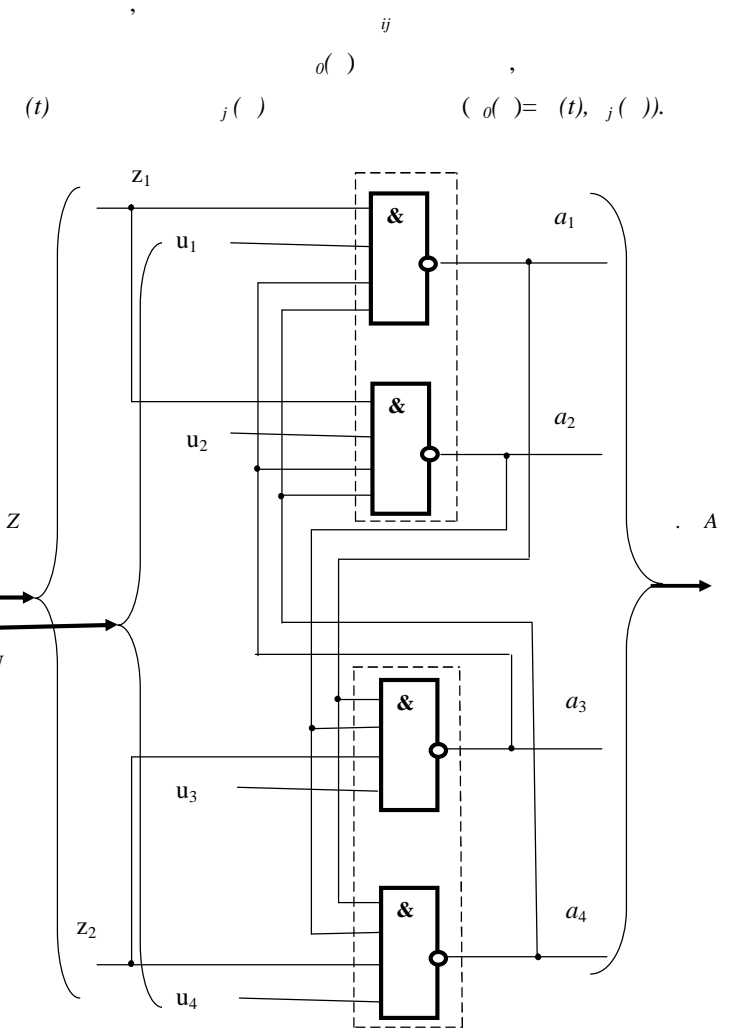
[3, 6, 8, 11, 29-32, 39]
 (t) (t)
 $\{X\} \xrightarrow{e_j} \{A\}$, j
 j [12].
 $(.8.3)$, z_1
 z_2 , z_1 , z_3 z_4
 z_2 (.8.7).
 (t) .8.8,
 j (.8.9).

8.8.

	z		
		z_1	
0		0	
1		0	
2		1	

8.9.

	j	1	2	3	4	5	6	7	8	9
u_i										
u_1		0	0	0	1	1	1	1	1	1
u_2		1	1	1	0	0	0	1	1	1
u_3		0	1	1	0	1	1	0	1	1
u_4		1	0	1	1	0	1	1	0	1



.8.7.

8.10

8.10

$$\{X\} \xrightarrow{e_j} \{a\}$$

(. 8.7)

. 8.10.

8.10.

--	--	--

$f(\)$

μ

(-)

$j(\)$

$s (s \in \ ; \ j; \ , \ s \in \mu)$

[10, 11]

[6]

$a(\)$

$f(\)$

$$\{X\} \xrightarrow{e_j} \{a\}$$

[4, 15, 26, 27, 31, 37],

$f(\)$

(. 4.6),

(. 4.7)

(. 4.8)

o

(. 3.4),

8.11.

		L	L ^M	
--	--	---	----------------	--

M_{max}	8	30	90	L^M
F_p	12,5 M	12,5 M	10 M	L
P_Q	3	6	9	L^M
S ($=28$)	756	18	12	L^M
L ($=28$)	1	0,2	0,3	L
r_e	1	3	3	L L^M

’ ,
 j
 [1, 3, 8-11, 30-32, 37, 39],

[6]

[4, 15, 26, 27, 31, 37].

8.11.

8.5.2.

- ’
1. ’ , 10 (, 90).
 2. 5 (
 - 1 5).
 3. 10 , , .
 4. , (
 - 1 < 0,8).

- () , j , ,
 :
 1. () ()
 , .
 2. j
 () () ;
 3. () ()
 () .
 ”
 ”[18].

8.6.

1. ()?
2. ,
 ?
3. , .
4. , .
5. .
6. , .
7. r_e $f()$
8. (t) , , .
9. , , .
10. , .

- 11.
- 12.
- 13.
14. (i)
- 15.
- 16.
- 17.
- ?
- 18.
19. ?
20. ?
- 21.
- 22.
- 23.
24. ?
25. ?
26. ?
- 27.
- 28.
29. ?
30. ?
- 31.
- 32.
- ,

9.

9.1.

$(x_{n-1}, \dots, x_1, x_0)$ is a binary vector of length n .
 The number of such vectors is 2^n .
 For $n=5$, the vector (01011) is one of them.
 The number of vectors with m ones is $\binom{n}{m}$.
 The total number of vectors is $\sum_{m=0}^n \binom{n}{m} = 2^n$.
 For $m < 2^n$, the number of vectors with m ones is $\binom{n}{m}$.

(9.1)

$$\begin{cases} D_0 = \overline{x_{n-1}} \overline{x_{n-2}} \dots \overline{x_1} \overline{x_0}; \\ \dots \\ D_{m-1} = x_{n-1} x_{n-2} \dots x_1 x_0. \end{cases} \quad (9.2)$$

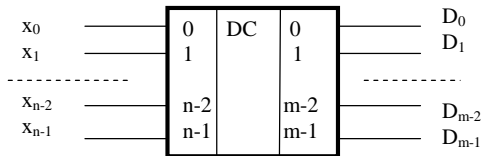
$D_0, D_1, \dots, D_{m-2}, D_{m-1}$;
 $x_0, x_1, \dots, x_{n-2}, x_{n-1}$.
 (9.2)

(x_i) is a binary vector of length n .
 The number of such vectors is 2^n .
 For $n=5$, the vector (01011) is one of them.
 The number of vectors with m ones is $\binom{n}{m}$.
 The total number of vectors is $\sum_{m=0}^n \binom{n}{m} = 2^n$.
 For $m < 2^n$, the number of vectors with m ones is $\binom{n}{m}$.

9.1.

(9.2)

[31]:



9.1.

- 1.
- 2.
- 3.

4. $F = 1/K$, (9.3)

$F = \dots$;
 $K = \dots$;

5. (\dots) ,

6. (\dots)

).

(9.2)

$n(2n)$

9.2

n

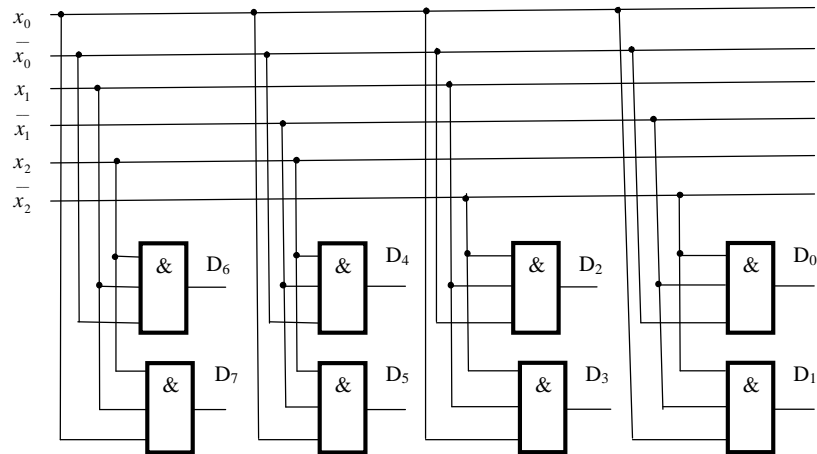
$N = m = 2^n$.

$= m * n$.

$= 1$

(9.3)

$F = 1/$



. 9.2.

(9.2)

$= 2^{n-1}$

(9.4)

(9.4)

n

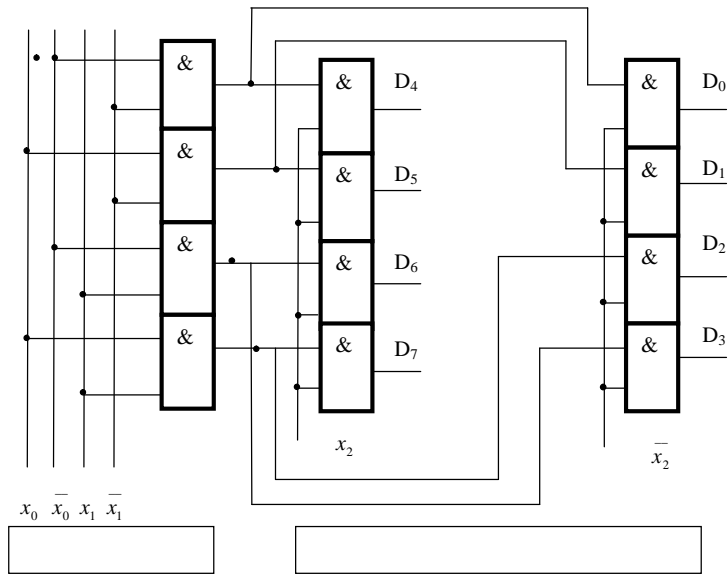
$n=8$

$o=8 = 10$,

$= 2^7 = 128 >>$

, ,
 , , $x_1 x_0, x_1 \bar{x}_0, \bar{x}_1 x_0, \bar{x}_1 \bar{x}_0$,
 ,
 , $x_2 x_1 x_0, x_2 x_1 \bar{x}_0, x_2 \bar{x}_1 x_0, x_2 \bar{x}_1 \bar{x}_0, \bar{x}_2 x_1 x_0, \bar{x}_2 x_1 \bar{x}_0, \bar{x}_2 \bar{x}_1 x_0, \bar{x}_2 \bar{x}_1 \bar{x}_0$

.9.3 $n=3$.



.9.3. $n=3$

$=n-1$.

N_n :

$$N_n = 2^2 + 2^3 + \dots + 2^n = 4(2^{n-1} - 1). \tag{9.5}$$

n :

$$n = 2 * N_n = 8(2^{n-1} - 1). \tag{9.6}$$

$$F_n = 1/(n-1), \tag{9.7}$$

$N_n, n, F_n -$

$K_{p,u_i} -$

$$K_{p,u_i} = 2^i, \tag{9.8}$$

$= 1, 2, \dots, n-1 -$

$j-$

D_0, D_1, \dots, D_{m-1}

$=2.$

$r,$

$j=n/r.$

r-

j-

(9.13) (9.14)

$$N_{np} = j \cdot 2^r + 2^n = n \cdot 2^r / r + 2^n. \quad (9.9)$$

$$= j \cdot r \cdot 2^r + j \cdot 2^n = n(2^r + 2^n / r). \quad (9.10)$$

(N_{np} , -
).

$$\frac{dC_{np}}{dr} = 0$$

$$r \cong n/2, \quad (9.10)$$

$$r_1 = (n+1)/2$$

$$n - \\ = 1/2 .$$

$$r = n/2 \quad n \\ r_2 = (n-1)/2$$

$$(9.11)$$

$$n=4.$$

$$j=2$$

$$r=2.$$

$$\begin{cases} D_0 = (\bar{x}_3 \bar{x}_2)(\bar{x}_1 \bar{x}_0); \\ \dots \\ D_{16} = (x_3 x_2)(x_1 x_0). \end{cases}$$

$$(9.12)$$

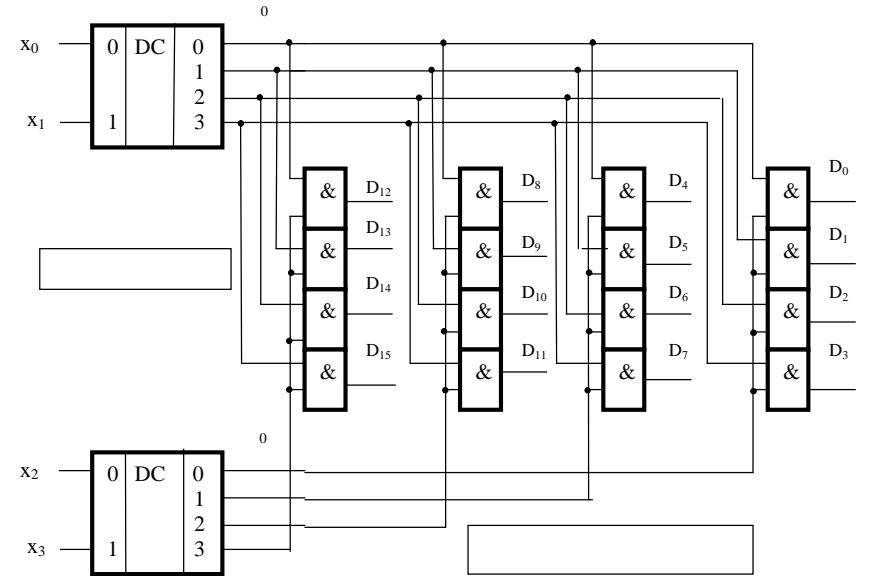
$$\begin{cases} A_3 = x_1 x_0; A_2 = x_1 \bar{x}_0; A_1 = \bar{x}_1 x_0; A_0 = \bar{x}_1 \bar{x}_0; \\ B_3 = x_3 x_2; B_2 = x_3 \bar{x}_2; B_1 = \bar{x}_3 x_2; B_0 = \bar{x}_3 \bar{x}_2. \end{cases}$$

$$(9.13)$$

$$(9.12)$$

$$\begin{cases} D_0 = B_0 A_0; D_4 = B_1 A_0; D_8 = B_2 A_0; D_{12} = B_3 A_0; \\ D_1 = B_0 A_1; D_5 = B_1 A_1; D_9 = B_2 A_1; D_{13} = B_3 A_1; \\ D_2 = B_0 A_2; D_6 = B_1 A_2; D_{10} = B_2 A_2; D_{14} = B_3 A_2; \\ D_3 = B_0 A_3; D_7 = B_1 A_3; D_{11} = B_2 A_3; D_{15} = B_3 A_3. \end{cases}$$

$$(9.14)$$



.9.4.


n

(9.4),

n

r=n/2.

(.9.5).

$$r - \quad \quad \quad l = 2^r, \quad (9.15)$$


r
 r

9.5. n

$$(9.15) \quad \quad \quad \left. \begin{aligned} l = 2^r \\ l = 2^r \end{aligned} \right\} \quad (9.16)$$

$r_M = r_C = r,$

(9.15)

$n=7 \quad r_M = (n-1)/2 = 3, \quad r_C = (n+1)/2 = 4.$

$l = 2^4 = 16; \quad l = 2^3 = 8.$

$n=8, \quad r_M = r_C = 4; \quad l = l = 2^4 = 16.$

(K>2)

j

j

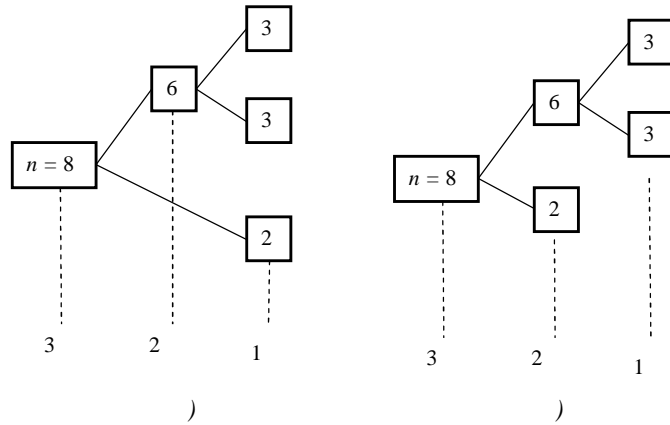
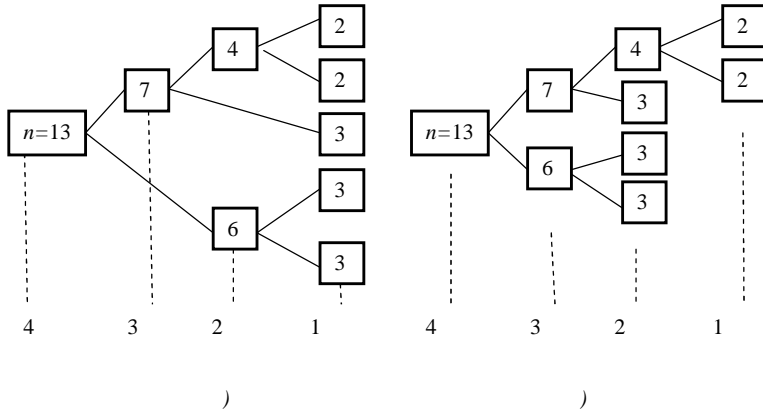
9.6

9.6,)

9.2.

()

(2)



.9.6.

, , ()
 .
 - () .

$2 \pmod{2}$

$$S = \begin{cases} a+b+z, & a+b+z < 2; \\ a+b+z-2, & a+b+z \geq 2; \end{cases} \quad (9.17)$$

$$P = \begin{cases} 0, & a+b+z < 2; \\ 1, & a+b+z \geq 2, \end{cases}$$

$S, P -$;
 $z -$;
 (9.17), ,
 9.1), $S P$ (.

$$\begin{cases} S = a\bar{b}\bar{a}b; \\ P = ab. \end{cases} \quad (9.18)$$

9.1.

		1
		0
		0
		0
		1

$$\overline{a \vee b} = \bar{a}\bar{b}, \overline{ab} = \bar{a} \vee \bar{b} \quad (9.18)$$

$$\begin{cases} S = \overline{ab \vee \bar{a}\bar{b}} = \overline{b \vee \bar{a}} \bar{b} \\ P = \overline{ab} = \bar{a} \vee \bar{b} \end{cases} \quad (9.19)$$

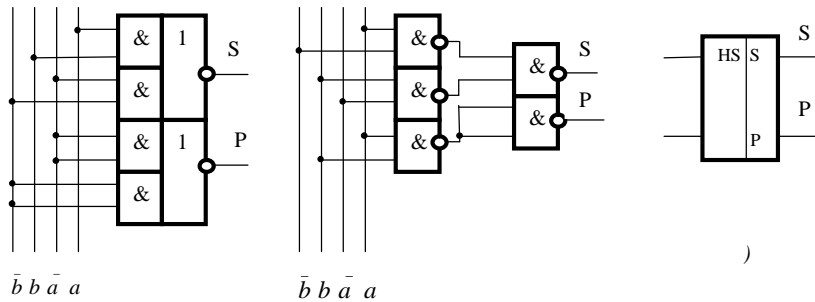
. 9.7,)

$F=1/$

. 9.7,)

(9.20).

. 9.7,)



a)

9.7.

(9.18)

$$\begin{cases} S = \overline{ab \vee \bar{a}\bar{b}} = \overline{a\bar{b} \vee \bar{a}b} \\ P = \overline{ab} \end{cases} \quad (9.20)$$

(. 9.2).

$$\begin{cases} S = \bar{a}\bar{b}z \vee \bar{a}b\bar{z} \vee a\bar{b}\bar{z} \vee abz \\ P = \bar{a}bz \vee \bar{a}\bar{b}\bar{z} \vee ab\bar{z} \vee abz \end{cases} \quad (9.21)$$

(9.21)

9.2.

		1	0
		((
		(
		(
]	(
		(
]	(
]	
]	

(9.21)

$$\begin{cases} S = \overline{abz} \vee \overline{a\bar{b}z} \vee \overline{abz} \vee \overline{a\bar{b}z}; \\ P = ab \vee az \vee bz = \overline{\bar{b} \vee \bar{a} \vee \bar{b} \vee \bar{z}}. \end{cases} \quad (9.22)$$

. 9.9.

2

(9.22),

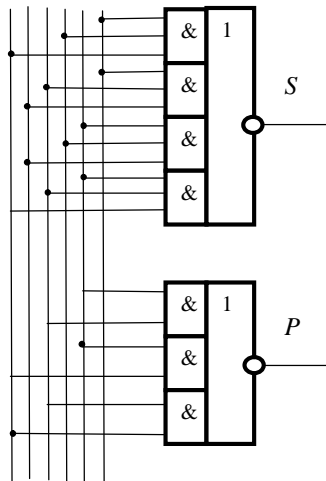
-1020

$$S = \bar{S}_1 z \vee S_1 \bar{z}; \quad P = P_1 \vee S_1 z. \quad (9.23)$$

$S_1 -$

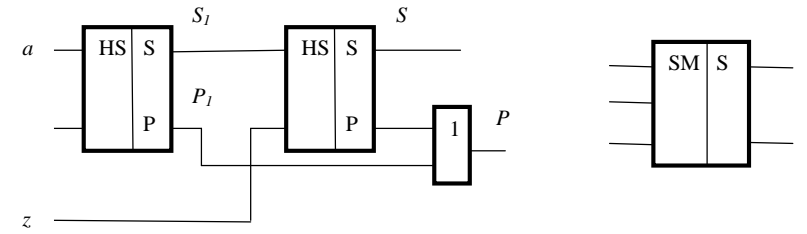
$1 -$

$\bar{z} z \bar{b} b \bar{a} a$



. 9.9.

. 9.10.



. 9.10.

8421,

(. 9.3.).

9.3.

8421

0			
1			
2			
3			
4			
5			
6			
7			
8			
9			

1. $S = a + b + z < 10$,
 $a, b, z =$

1. $a = 2 \ 0010$

$b = 3 \ 0011$

$z = 1 \ 0001$

$S = 6 \ 0110$

2. $10 \leq S \leq 15$.

1010, 1011, 1100, 1101, 1110, 1111

10

0110.

3. $16 \leq S \leq 19$.

16,

6

-0110.

$$\begin{array}{r}
 2 \\
 a=6 \ 0110 \\
 b=7 \ 0111 \\
 \underline{z=0 \ 0000} \\
 S=13 \ 1101 \\
 -10 \ 0110 \\
 S=3 \ 10011
 \end{array}$$



$$\begin{array}{r}
 3 \\
 a=8 \ 1000 \\
 b=9 \ 1001 \\
 \underline{z=1 \ 0001} \\
 S=18 \ 10010 \\
 -10 \ 0110 \\
 S=8 \ 11000
 \end{array}$$



(.9.11).

$ab =$

$ab (cd)$

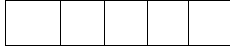
cd

10.

3,

16

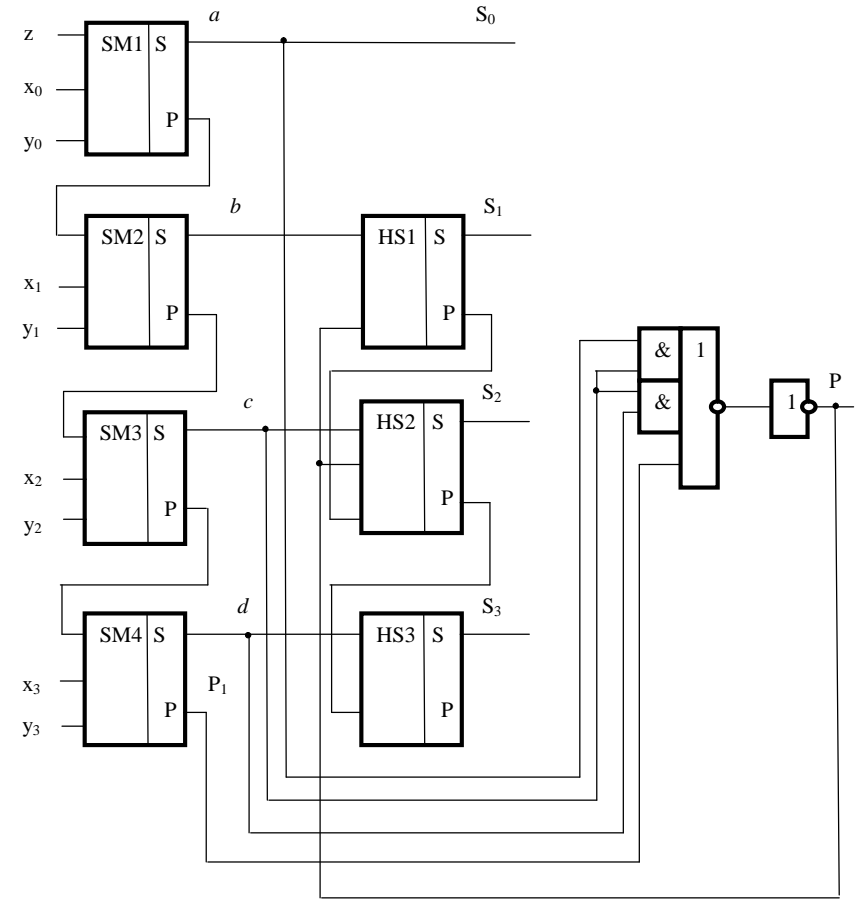
n	\bar{a}	a	\bar{a}	a
4	$\bar{c}\bar{d}$			
	$\bar{c}d$			
	cd	1	1	1
	$\bar{c}\bar{d}$		1	1



.9.11.

.9.11

$$F(abcd) = cd \vee ac$$



.9.12.

. 9.12

HS1

SM3.

$$\frac{\underline{\underline{\quad}}}{\underline{\underline{\quad}}} = cd v ac v \quad (9.24)$$

9.3.

1. ?
2. ?
3. n ?
4. ?
5. ?
6. ?
7. ?
8. ?
9. ?
10. ?
11. ?
12. ?
13. ?
14. n=3.
15. ?
16. ?
17. ?
18. ?
19. ?
20. ?
21. ?
22. ?

23. ?
24. ?
25. ?
26. ?
27. ?
28. ?
29. ?
30. ?
31. ?

10.

10.1.

Let a_0, a_1, \dots, a_{n-1} be the digits of the number a in base p , so that

$$a = a_{n-1}p^{n-1} + a_{n-2}p^{n-2} + \dots + a_1p + a_0.$$

Let a' be the number obtained from a by reversing the order of the digits, so that

$$a' = a_0p^{n-1} + a_1p^{n-2} + \dots + a_{n-2}p + a_{n-1}.$$

Then

$$a + a' = (a_{n-1} + a_0)p^{n-1} + (a_{n-2} + a_1)p^{n-2} + \dots + (a_1 + a_{n-2})p + (a_0 + a_{n-1}).$$

Since $a_{n-1} + a_0, a_{n-2} + a_1, \dots, a_1 + a_{n-2}, a_0 + a_{n-1}$ are all less than p , we have

$$a + a' = n_p - 1, \tag{10.1}$$

where n_p is the number $10\dots 01$ in base p .

Let a be a number in base p with n digits $a_{n-1}, a_{n-2}, \dots, a_1, a_0$. Let a' be the number obtained from a by reversing the order of the digits, so that

$$a' = a_0p^{n-1} + a_1p^{n-2} + \dots + a_{n-2}p + a_{n-1}.$$

Then

$$a + a' = (a_{n-1} + a_0)p^{n-1} + (a_{n-2} + a_1)p^{n-2} + \dots + (a_1 + a_{n-2})p + (a_0 + a_{n-1}).$$

Since $a_{n-1} + a_0, a_{n-2} + a_1, \dots, a_1 + a_{n-2}, a_0 + a_{n-1}$ are all less than p , we have

$$a + a' = n_p - 1, \tag{10.1}$$

where n_p is the number $10\dots 01$ in base p .

	$n-1$	a_{n-2}	a_{n-3}	a_{n-4}	\dots	a_2	a_1	a_0
	0	1	0	1	\dots	0	1	1
$, = 1,$	0	0	1	0	\dots	0	1	0
$, = 1,$	0	0	1	\dots	1	1	1	0
$, = 1$	1	0	1	\dots	1	0	1	0
$, = 1$	1	1	0	\dots	0	1	0	1
	1	0	1	\dots	1	0	0	0
$, = 1$	1	1	0	1	\dots	1	0	1
$, = 1$	1	1	0	\dots	0	1	0	1

$$= \left\{ \begin{array}{l} +, \leq n-k-1 \\ + -n, > n-k-1 \end{array} \right\} \vee \left\{ \begin{array}{l} -, \geq k \\ K_{n-k+n}, < k \end{array} \right\}; \quad (10.3)$$

1. $2n - n+k$ $n -$ j $2n (n-$ $)$ $j=0, 1, \dots, 2n-1.$

1.

$$= \left\{ \begin{array}{l} +, \leq n-k-1 \\ 0, > n-k-1 \end{array} \right\} \vee \left\{ \begin{array}{l} -, \geq k \\ 0, < k \end{array} \right\} \quad (10.1)$$

$=0,1,2,\dots,n-1;$

4.

$$j = \left\{ \begin{array}{l} 0, 0 \leq j < n-k \\ , j = n-k+i \\ n-1, 2n-k-1 < j \leq 2n-1 \end{array} \right\} \vee \left\{ \begin{array}{l} 0, 0 \leq j < k \\ , j = i+k \\ n-1, n+k-1 < j \leq 2n-1 \end{array} \right\}; \quad (10.4)$$

$$j = \left\{ \begin{array}{l} i, j = n-k+1 \\ 0, , \end{array} \right\} \vee \left\{ \begin{array}{l} , j = k+ \\ 0, , \end{array} \right\} \quad (10.5)$$

(, 2- , 4-) ;

2.

$$= \left\{ \begin{array}{l} +, \leq n-k-1 \\ + -n, > n-k-1 \end{array} \right\} \vee \left\{ \begin{array}{l} -, n-1 \geq \geq k \\ K_{n-k}, = n-1 \\ 0, i < k \end{array} \right\}; \quad (10.2)$$

$=0,1,2,\dots,n-1;$

(10.5).

$$j = \left\{ \begin{array}{l} i, j = 2+i \\ 0, , \end{array} \right\} \vee \left\{ \begin{array}{l} 0, 0 \leq j < 4 \\ , j = i+4 \end{array} \right\}$$

$i = 0,1,2,3$

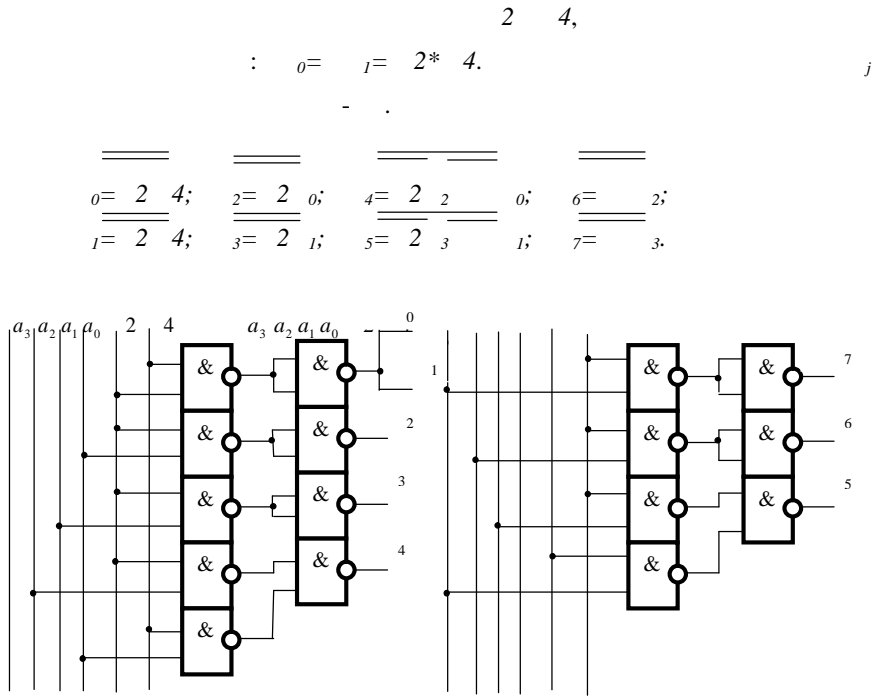
$$\begin{array}{ll} 0=0; & 4= 2 \ 2 \ v \ 0; \\ 1=0; & 5= 2 \ 3 \ v \ 1; \\ 2= 2 \ 0; & 6= 2; \\ 3= 2 \ 1; & 7= 3. \end{array}$$

$n-1 -$ (10.2)

(10.2)

$0 \ n-1$

3.



. 10.1.

10.2.

n -
: = ; ; $A > B$; $A < B$; $A \leq B$; $A \geq B$.

$$\begin{aligned}
 & \text{CP}_{A=B} = \begin{cases} 1, A = B; \\ 0, A \neq B \end{cases} & \text{CP}_{A \neq B} = \begin{cases} 1, A \neq B; \\ 0, A = B \end{cases} & (10.6) \\
 & \text{CP}_{A > B} = \begin{cases} 1, A > B; \\ 0, A \leq B \end{cases} & \text{CP}_{A < B} = \begin{cases} 1, A < B; \\ 0, A \geq B \end{cases} & (10.7) \\
 & \text{CP}_{A \geq B} = \begin{cases} 1, A \geq B; \\ 0, A < B \end{cases} & \text{CP}_{A \leq B} = \begin{cases} 1, A \leq B; \\ 0, A > B \end{cases} & (10.8)
 \end{aligned}$$

n -
 $a_{n-1} = b_{n-1}; a_{n-2} = b_{n-2}; \dots; a_1 = b_1; a_0 = b_0$
 $a_{n-1} \ b_{n-1}; \ a_{n-2} \ b_{n-2}; \dots; \ a_1 \ b_1; \ a_0 \ b_0$.

$$\text{CP}_{A=B} = \bigwedge_{i=0}^{n-1} (a_i b_i \vee \bar{a}_i \bar{b}_i) = \overline{\bigwedge_{i=0}^{n-1} (a_i \bar{b}_i \vee \bar{a}_i b_i)}, \quad (10.9)$$

b_i -

$$\text{CP}_{A \neq B} = \bigvee_{i=0}^{n-1} (a_i \bar{b}_i \vee a_i b_i) = \bigvee_{i=0}^{n-1} \overline{(a_i \bar{b}_i \vee \bar{a}_i b_i)}, \quad (10.10)$$

(10.9) (10.10)

$$\overline{a \vee b} = \bar{a} \bar{b} \quad (10.9)$$

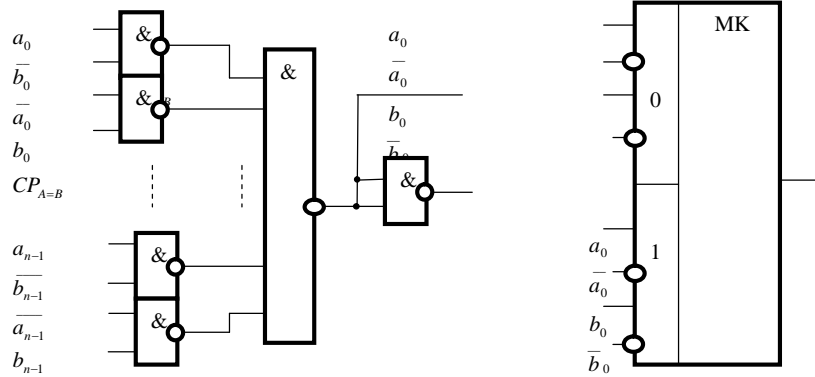
$$CP_{A=B} = \bigwedge_{i=0}^{n-1} (a_i \bar{b}_i \vee \bar{a}_i b_i) = \bigwedge_{i=0}^{n-1} \overline{(a_i \bar{b}_i)(b_i \bar{a}_i)}. \quad (10.11)$$

(10.10),

$$CP_{A \neq B} = \bigvee_{i=0}^{n-1} (a_i \bar{b}_i \vee \bar{a}_i b_i) = \bigvee_{i=0}^{n-1} \overline{(a_i \bar{b}_i)(b_i \bar{a}_i)}. \quad (10.12)$$

. 10.2

(10.11) (10.12),



. 10.2.

$$F_{A=B} = 1/3\tau \quad i \quad F_{A \neq B} = 1/2\tau \quad (-$$

-).

2n+1

2n-

$$= 6n+2.$$

. 10.3

CP_{A>B}.

$a_2 a_1 a_0 \backslash$	0	0	0	0	1	111	1	1
$b_1 b_0$	0	1	1	0	0	0	1	0
000								
001								
011								
010								
110								
111					1			
101								
100								

. 10.3.

6

$$CP_{A>B} = a_2 \bar{b}_2 \vee \bar{a}_2 a_1 \bar{b}_2 \bar{b}_1 \vee a_2 a_1 b_2 \bar{b}_1 \vee a_2 \bar{a}_1 a_0 b_2 \bar{b}_1 \bar{b}_0 \vee \bar{a}_2 \bar{a}_1 a_0 \bar{b}_2 \bar{b}_1 \bar{b}_0 \vee a_2 a_1 a_0 b_2 b_1 \bar{b}_0 \vee \bar{a}_2 a_1 a_0 \bar{b}_2 b_1 \bar{b}_0.$$

$$CP_{A>B} = a_2 \bar{b}_2 \vee (a_2 b_2 \vee \bar{a}_2 \bar{b}_2)(a_1 \bar{b}_1 \vee (a_1 b_1 \vee \bar{b}_1) a_0 \bar{b}_0).$$

\bar{b}_i

$$a_1 \vee \bar{a}_1,$$

$$CP_{A>B} = a_2 \bar{b}_2 \vee F_2(a_1 \bar{b}_1 \vee F_1 a_0 \bar{b}_0), \quad (10.13)$$

$$F_i = a_i b_i \vee \bar{a}_i \bar{b}_i -$$

$$(10.13)$$

n-

$$CP_{A>B} = a_{n-1} \bar{b}_{n-1} \vee F_{n-1}(a_{n-2} \bar{b}_{n-2} \vee F_{n-2}(a_{n-3} \bar{b}_{n-3} \vee \dots \vee F_2(a_1 \bar{b}_1 \vee F_1 a_0 \bar{b}_0) \dots). \quad (10.14)$$

A > B.

10.3.

— , ,

8421, 8421

6 (8421+0110)

n-

() .

8421 8421+6.

. 10.1.

10.1.

	8421				8421+6			
0								
1								
2								
3								
4								
5								

6							
7							
8							
9							

8421+6

0, y1, y2 3

x3, x2, x1, x0.

$$y_0 = x_0;$$

$$y_1 = x_3 \vee x_1;$$

$$y_2 = x_3 \vee x_2 x_1 \vee x_2 x_1;$$

$$y_3 = x_3 \vee x_2 \vee x_1.$$

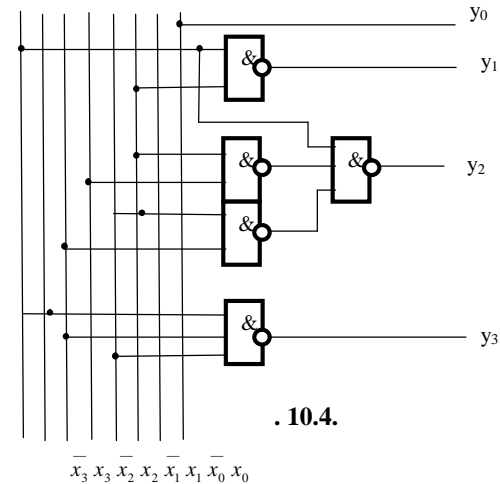
(10.15)

(10.15),

. 10.4

8421

8421+6.



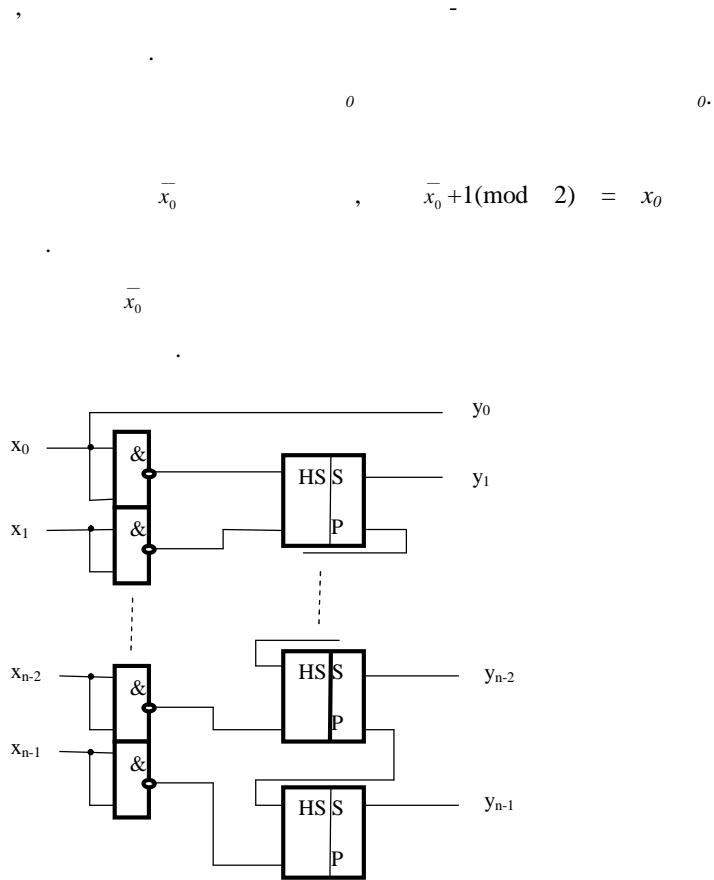
. 10.4.

(>0),

(-)

(-) .
 (-) (-) = .

10.5.



10.5.

$$F = 1 / (t_{HS} + (n-2)t_n) \quad (10.16)$$

- ;
 HS - ;
 n - ;
 n - .

10.4.

1. ?
2. , ?
3. ?
4. ?
5. - ?
6. ?
7. ?
8. , ?
9. ?
10. ?
11. ?
12. ?
13. ?
14. , ?
15. ?
16. ?
17. ?

18. :

19. .

20. ?

21. = .

22. > < .

23. ≥ ≥ .

24. ?

25. ?

26. .

27. .

28. ?

29. 8421 8421+6.

30. .

31. , -

11.

11.1.

mod 2.

[4, 6, 31, 32, 35].

(), Pentium)

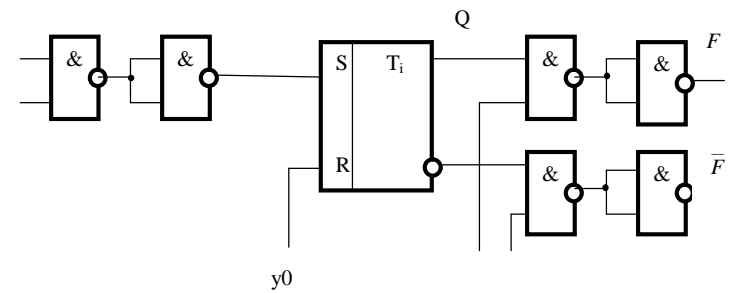
32-

“ ” ()

(,)

(, ,).

11.1



. 11.1.

“ 0” (S=0; R=1)

RS-

. Q=0; Q-bar=1.

RS-

“0”,

RS-

0,

(S=0; R=0),

Q=0; Q-bar=1

(S=1; R=0)

=1 RS-

. Q=1; Q-bar=0.

RS-

RS-

0,

“ 0” ("0"),

$$Q = 1; \bar{Q} = 0 \quad (S=0; R=0),$$

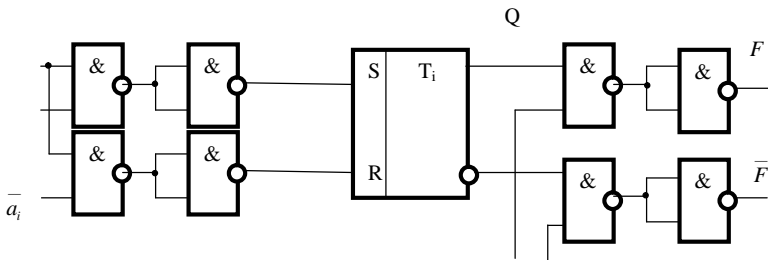
$$F_i = *Q_i; \bar{F}_i = *\bar{Q}_i. \quad (11.1)$$

$$* = 0 \quad (11.2)$$

$$(S=1; R=0, \quad S=0; R=1),$$

$$Q = 0; \bar{Q} = 1 \quad Q = 1; \bar{Q} = 0.$$

$$Q = 1; \bar{Q} = 0 \quad Q = 0; \bar{Q} = 1 \quad (11.2).$$

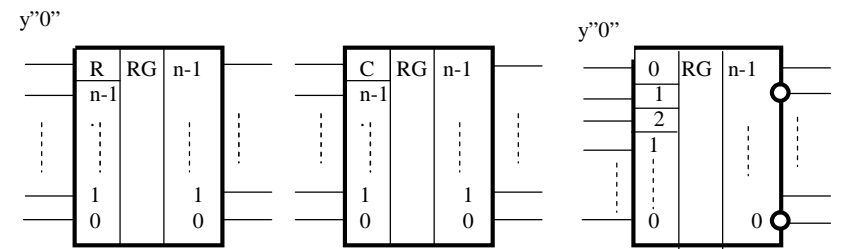


. 11.2.

$$* = 1 \quad (11.3)$$

$$t = 0 \quad + \quad + \quad , \quad (11.4)$$

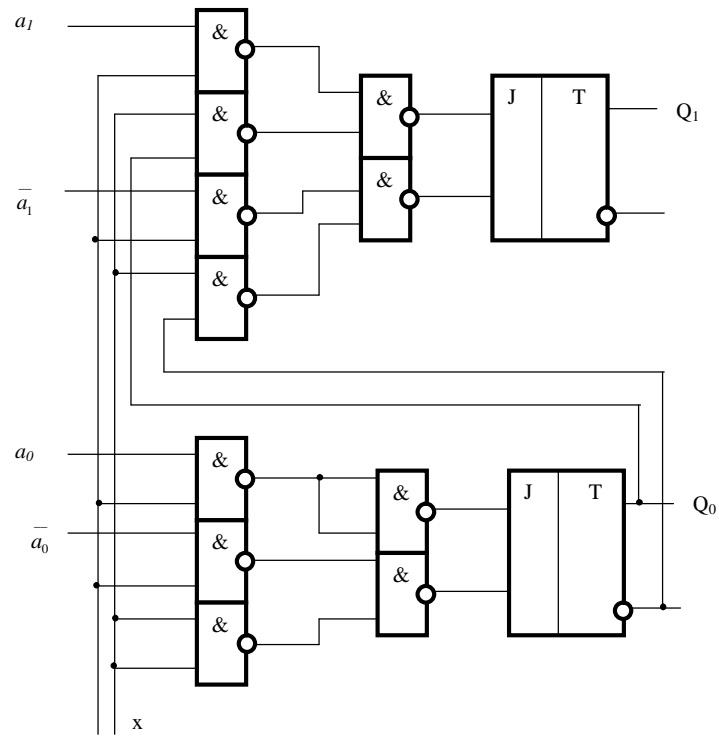
$$t = + \quad , \quad (11.5)$$



. 11.3.

() ,

() ,



. 11.4.

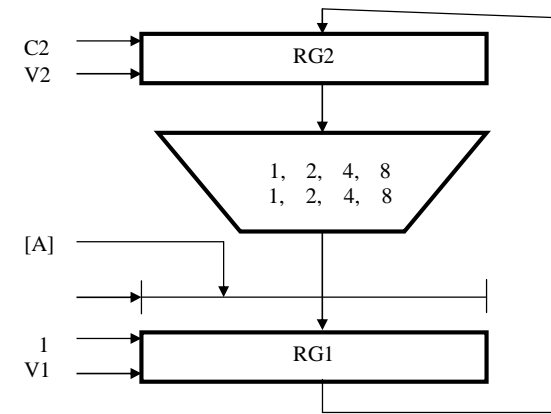
(JK-)

$$\begin{cases} K_0 = x \vee \bar{0}; \\ J_0 = \quad 0; \\ I = x \bar{Q}_0 \vee \bar{1}; \\ J_1 = x Q_0 \vee \quad 1. \end{cases} \quad (11.6)$$

. 11.4

(11.6).

. 11.5.



. 11.5.

RG1

[A]

1
2

VI.
V2

RG1

RG2,

(1, 2, 4, 8, 1, 2, 4, 8)
 RG2,
 RGI.

. 11.6

$$\begin{cases} R_0 = x_0 \vee x_1 \vee x_2 \vee \bar{Q}_1; & S_0 = K_0 \vee x_1 Q_1; \\ R_1 = x_0 \vee x_1 \bar{Q}_0 \vee x_2 Q_0; & S_1 = K_1 \vee x_2 Q_0. \end{cases} \quad (11.7)$$

$$* = 0 \quad (11.8)$$

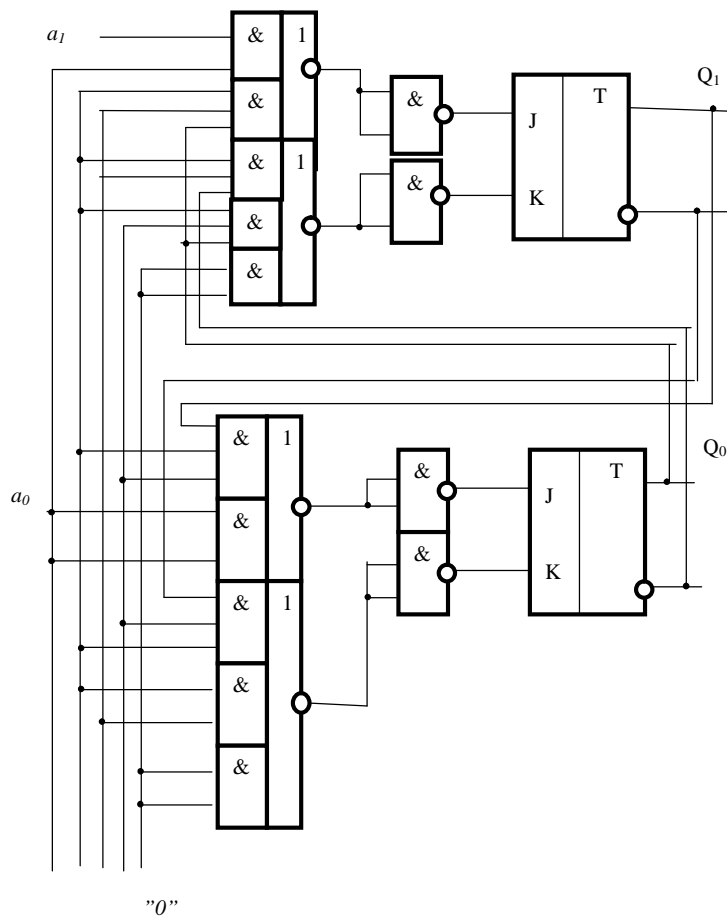
$$(11.7) \quad R_0 \quad S_0 \quad \bar{Q}_1 \quad Q_1$$

$$R_1 \quad S_1 \quad \bar{Q}_0 \quad Q_0$$

11.2.

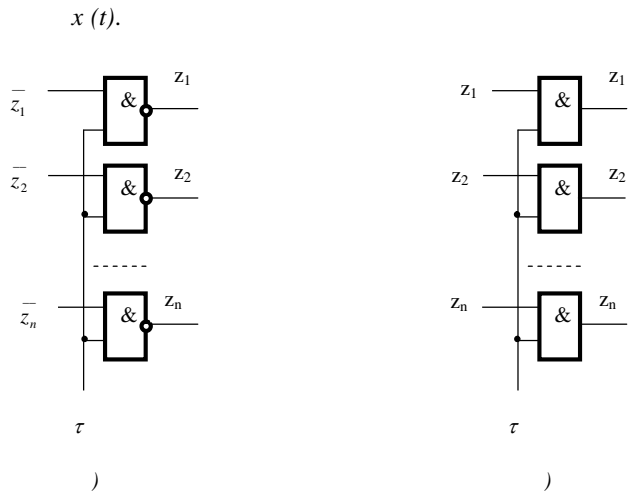
$x(t)$

. 11.7.



. 11.6.

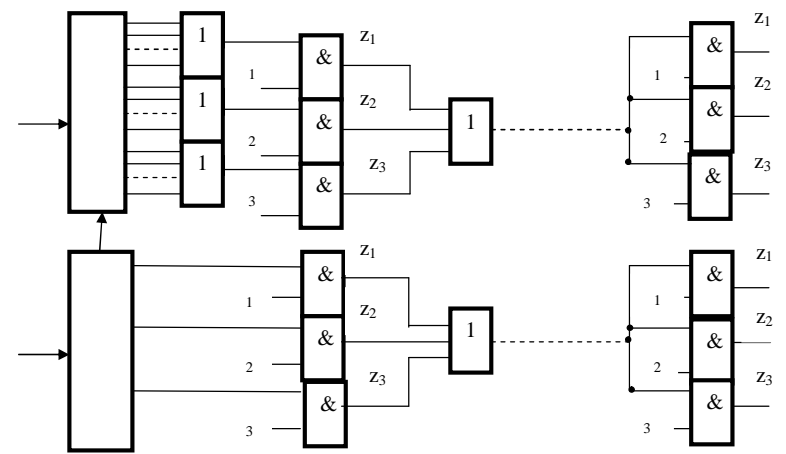
(), , ().
 ()
 :
 ,
 ()
 $x(t)$
 ()
 j



. 11.7.

()
 μ
 ()
 ,
 +1,
 +1,
 ()

()
 +1,
 :
 ,
 . 11.8.
 ,
 (= 1, 2, ..., K)



. 11.8.

(. 11.9).

(. 11.10)
 (,).

$y_j(t)$

$x(t)$,

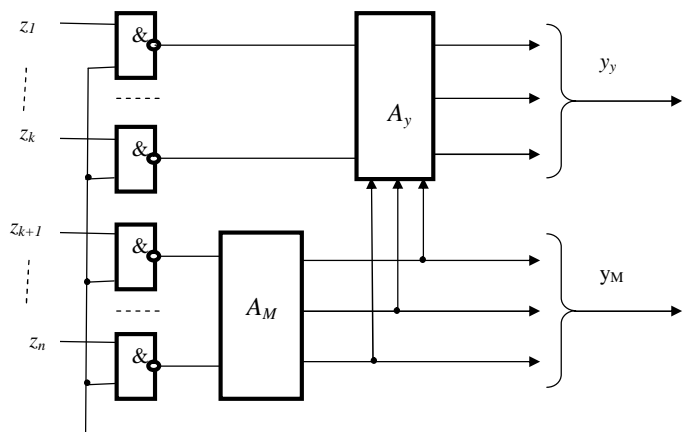
(. 11.9),

$x_i(t)$

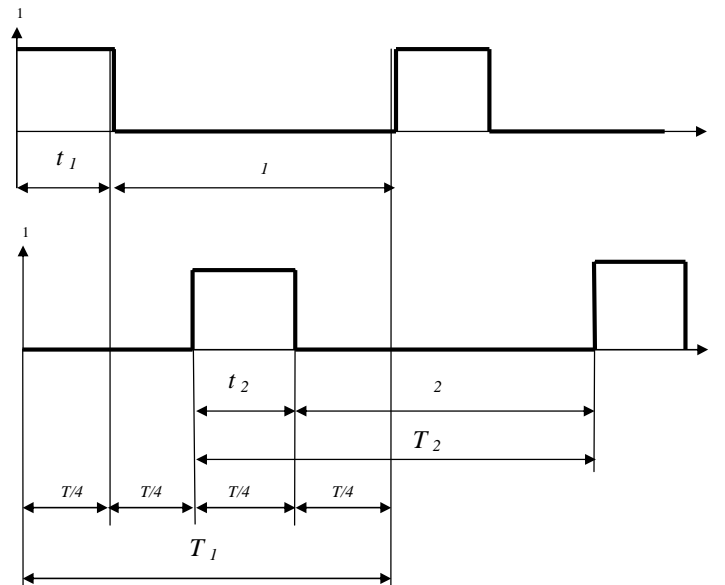
$z_i(i= 1, \dots, n)$

$y_j(t)$

(. 11.11).



. 11.9.



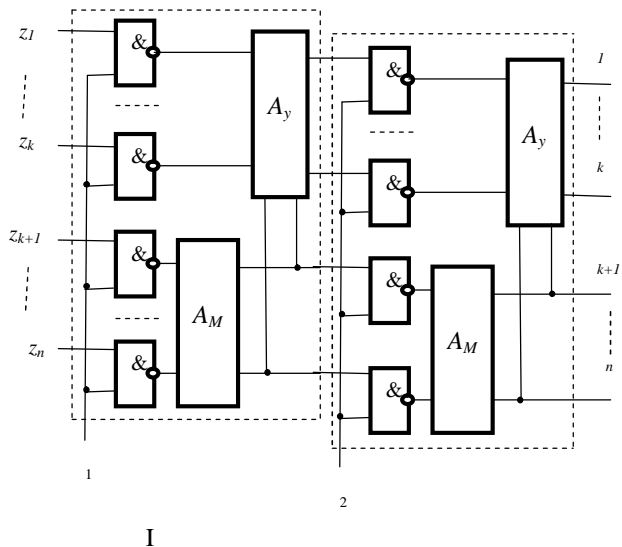
. 11.10.

(. 11.11)

$j = j(j = 1, 2)$.

2

()



. 11.11.

11.3.

1. ?
2. ?
3. ?
4. ?
5. ?
6. ?
7. ?
8. ?
9. ?

10. -
11. -
12. ?
13. ?
14. ?
15. ?
16. ?
17. ?
18. ?
19. ?
20. ?
21. -
22. -
23. -
24. -
25. -
26. -
27. -
28. -
29. -
30. -
31. -
32. -

12.

12.1.

Let K be a field and let n be a positive integer. Let α be a root of the polynomial $x^n - a$ in some extension of K . Let β be another root of $x^n - a$. Then $\beta = \alpha \zeta$ for some n -th root of unity ζ in the extension. The Galois group of $x^n - a$ over K is isomorphic to a semidirect product of a cyclic group of order n and a group of order $\phi(n)$, where ϕ is Euler's totient function. The action of the Galois group on the roots is given by $(\alpha, \zeta) \mapsto (\alpha \zeta^i, \zeta^i)$ for $i \in \mathbb{Z}/n\mathbb{Z}$.

),

Let K be a field and let n be a positive integer. Let α be a root of the polynomial $x^n - a$ in some extension of K . Let β be another root of $x^n - a$. Then $\beta = \alpha \zeta$ for some n -th root of unity ζ in the extension. The Galois group of $x^n - a$ over K is isomorphic to a semidirect product of a cyclic group of order n and a group of order $\phi(n)$, where ϕ is Euler's totient function. The action of the Galois group on the roots is given by $(\alpha, \zeta) \mapsto (\alpha \zeta^i, \zeta^i)$ for $i \in \mathbb{Z}/n\mathbb{Z}$.

(12.1)

$(K=2^n)$.

K .

$K \neq 2^n$,

()

$K=10$,

()

(12.1), $q=2$.

$n = \lceil \log_2 K \rceil$

(12.2)

[] -

(, $\lceil \log_2 5 \rceil = 3$).

()

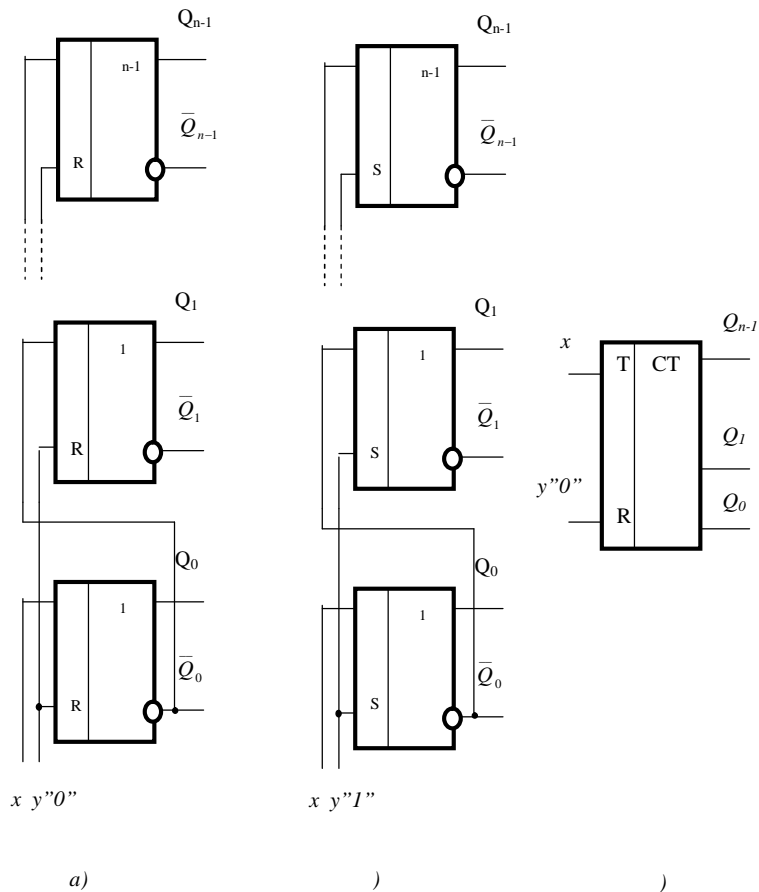
$$N = \sum_{i=0}^{n-1} Q_i 2^i, \quad (12.3)$$

$N -$

$n -$

$Q -$

$2 -$



(. 12.1,), ' - ,
 (. 12.1,). . 12.1,

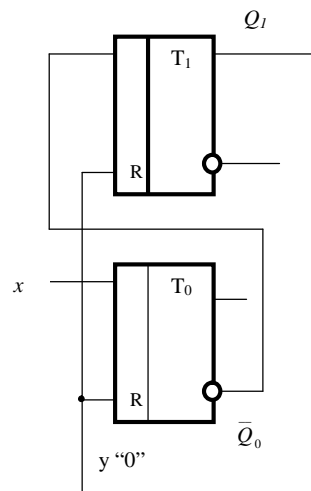
$$F = I / (n T + t) \quad (12.4)$$

$T -$;
 $t -$.

. 12.2.

4.

$$F = I / T \quad (12.5)$$



. 12.2.

. 12.3.

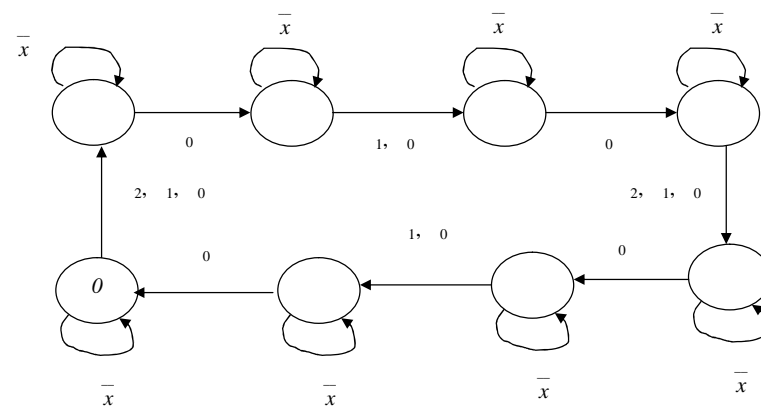
$$\begin{cases} 0 = ; \\ 1 = \bar{c} ; \\ 2 = \bar{c} \bar{b} ; \end{cases} \quad (12.6)$$

(12.6)

(. 12.4),

(12.6),

b_1 , 1 , 0).



. 12.3.

$$n = + 1, = 1, 2, \dots, n-1. \tag{12.7}$$

$$n > n_0 (\quad , \quad),$$

$$(\quad)$$

$$F = I/(n + T + t_c), \tag{12.8}$$

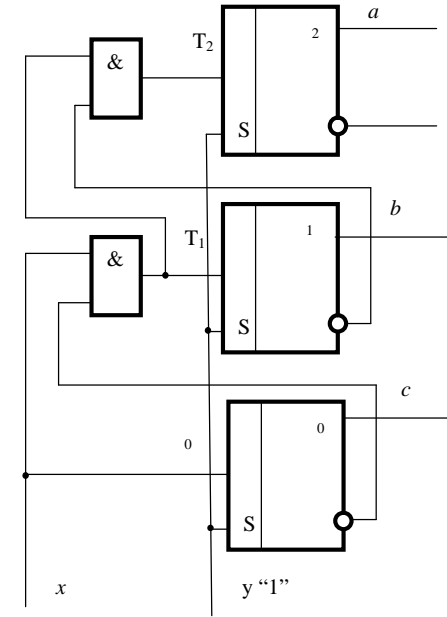
$$n - ;$$

$$T - ;$$

$$t_c - .$$

$$(11.6),$$

$$\begin{cases} 0 = ; \\ 1 = \bar{c} = 0 \bar{c} ; \\ 2 = \bar{c} \bar{b} = 1 \bar{b} ; \end{cases} \tag{12.9}$$

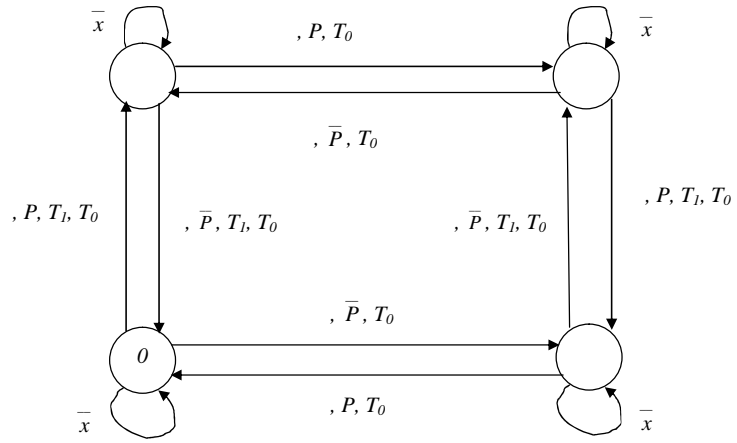


. 12.5.

$$= 0$$

$$= 1$$
S R.

. 11.6.

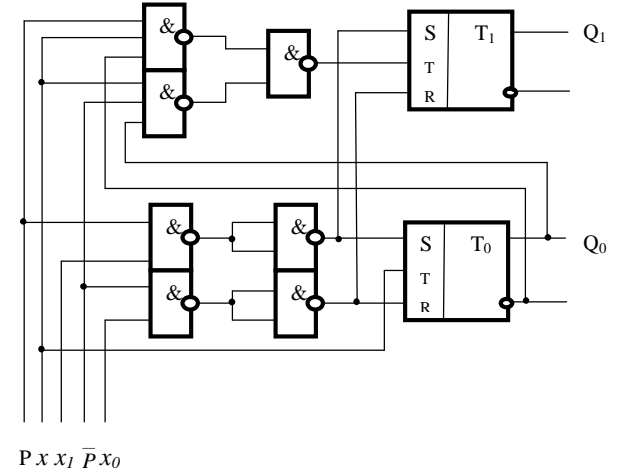


. 12.6.

$$\begin{cases} o = (ab \vee a\bar{b} \vee \bar{a}b \vee \bar{a}\bar{b}) \vee x\bar{P}(ab \vee a\bar{b} \vee \bar{a}b \vee \bar{a}\bar{b}) = x; \\ T_1 = xP(\bar{a}\bar{b} \vee \bar{a}b) \vee x\bar{P}(ab \vee \bar{a}b) = xP\bar{b} \vee x\bar{P}b. \end{cases} \quad (12.10)$$

$$o = \bar{\bar{0}}; \quad T_1 = \overline{xP\bar{b}} \quad \overline{x\bar{P}b}; \quad S = \overline{Px_1}; \quad R = \overline{Px_0}. \quad (12.11)$$

. 12.7



.12.7.

2^n ,

$$2^n > K > 2^{n-1}. \quad (12.12)$$

$$m = 2^n - K$$

n

(0

0 1 I),

:

m

$0, 1, \dots, m-1$

$+1, \dots, 2^n$

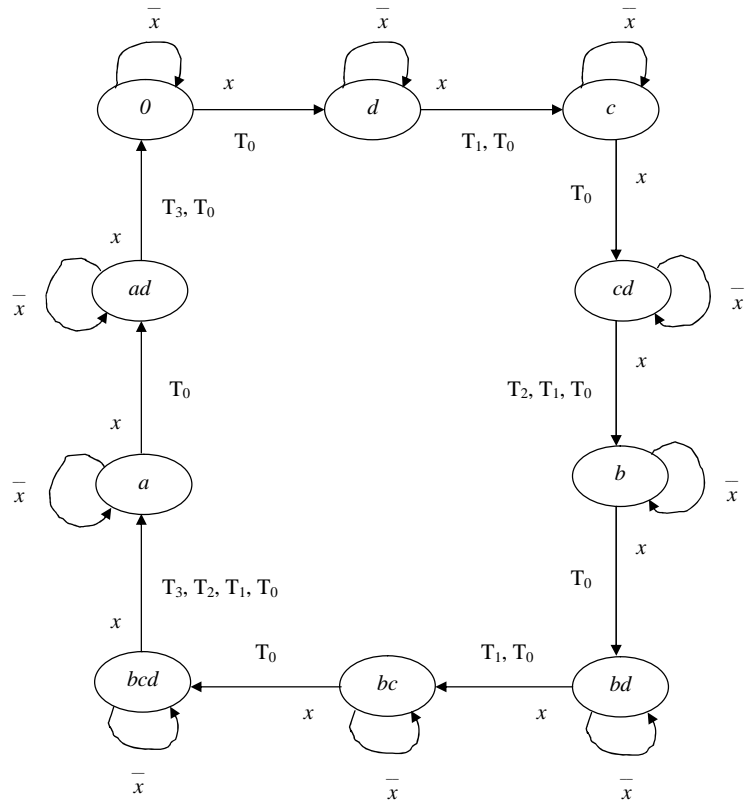
m

$m. = 10 (m$

$$= 2^n - 10 = 6)$$

0110,

8421+6.
0000, 0001, 0010, 0011, 0100, 0101.



. 12.8.

0000
1111.
8421.

8421,
1010, 1011, 1100, 1101, 1110,

. 12.8.

12.9),

$0 = ; 1 = \bar{a}d; 2 = cd; 3 = (ad \vee bcd).$ (12.13)

n	\bar{a}	a	\bar{c}	c	\bar{d}	d
4						
$\bar{c}\bar{d}$	1	1	1	1	1	1
$\bar{c}d$	1	1	1	1	1	1
cd	-	-	-	-	-	-
n	\bar{a}	a	\bar{c}	c	\bar{d}	d
4						
$\bar{c}\bar{d}$	0	1	1	0	0	0
$\bar{c}d$	0	1	1	0	0	0
cd	-	-	-	-	-	-
n	\bar{a}	a	\bar{c}	c	\bar{d}	d
4						
$\bar{c}\bar{d}$	0	0	1	0	0	0
$\bar{c}d$	0	0	1	0	0	0
cd	-	-	-	-	-	-

$\bar{c}a$	0	0	-	-	

$$a_2 = ab$$

n	\bar{a}	a	\bar{d}	d
$\bar{c}a$	0	0	0	0
$\bar{c}a$	0	0	1	0
cd	-	-	-	-
$\bar{c}a$	0	1	-	-

$$a_3 = ac \vee abd$$

.12.9.

(12.13)

(. 12.10).

0000 (0).

\bar{a}

3.

2

=0

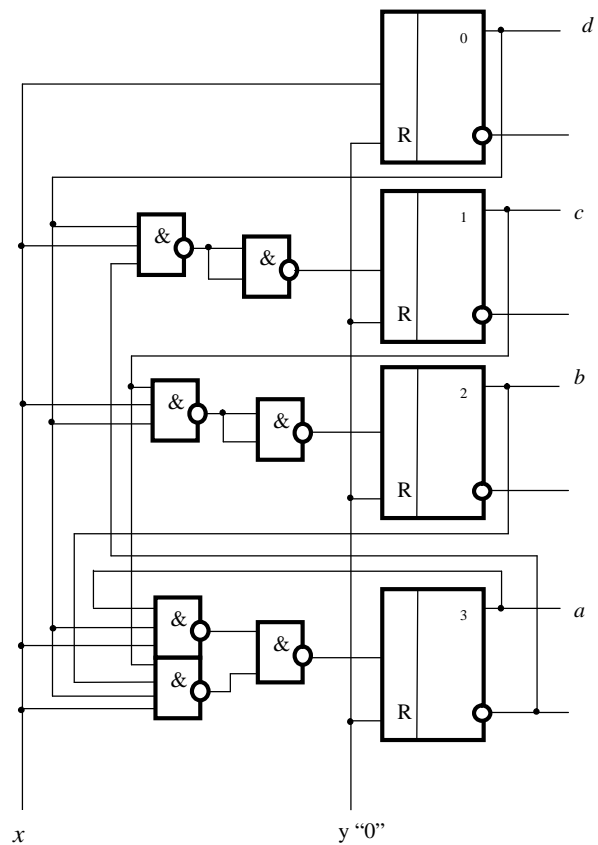
1

2

12.2.

[10].

1001(ad)

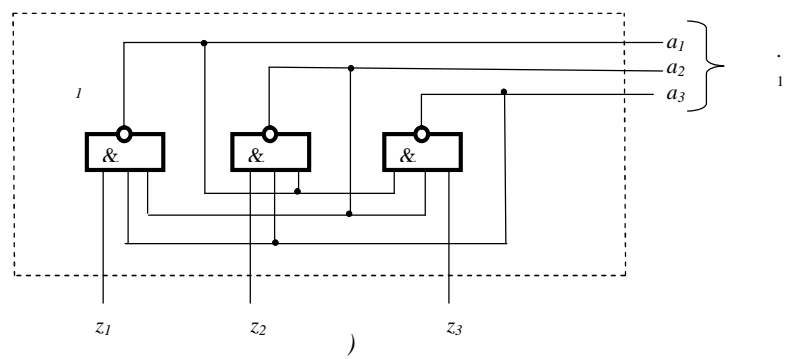
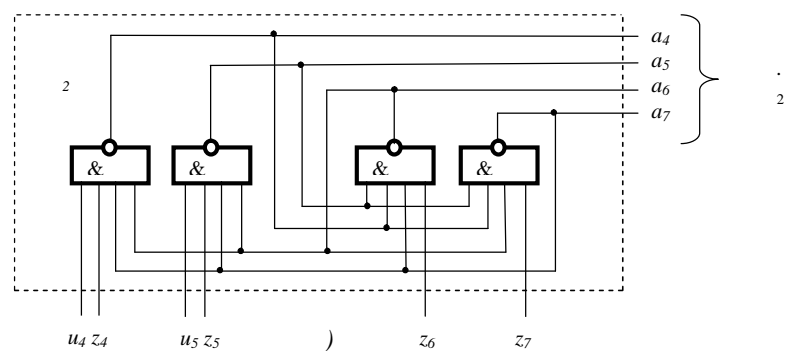
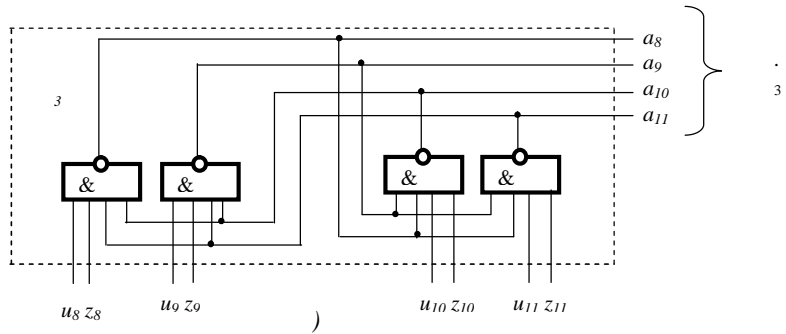


. 12.10.

$x(t) = \sum_{i=0}^{m-1} c_i 2^i$ (12.11),
 $(m_i = 3)$ (12.1, 12.2).
 $(R_1 = R_2 = R_3 = 1)$

12.1.

(. 11.11)



. 12.11.

$(m_1 = 3)$ (. 12.11,)
 $(R_1 = R_2 = R_3 = 1)$,

12.2).
 $x(t)$ (. 12.1,)
 $(m_2 = 3):$
 $(R_1 = 2; R_2 = R_3 = 1)$,
 $x(t)$ (. 12.3, 12.4).
 $(m_2 = 2):$
 $(R_1 = R_2 = 2)$,
 $x(t)$ (. 12.5, 12.6).
 $M_d (M_d = 18)$,
 $M_d \leq m_j * r_e$ (12.14)
 $m_j -$
 $r_e -$

12.1.

			A_i^1
$x_i^1(t)$	z_1 z_3	a_1 a_2	
x_0^1	0 0	1 1	A_0^1

x_1^1	1 0	0 1	A_1^1
x_2^1	0 0	1 0	A_2^1
x_3^1	0 1	1 1	A_3^1

12.2.

			$A_1^1,$,
()	z_1 z_2		
e_0^1	1 1		A_1^1, A_2^1, A_3^1

1

				A_7^2
$x_7^2(t)$	z_4 z_5 z_7	4 5 5 7		
$x_0^2(t)$	0 0 0	1 1 1		A_0^2
$x_1^2(t)$	1 0 0	0 1 1		A_1^2
$x_2^2(t)$	0 1 0	1 0 1		A_2^2
$x_3^2(t)$	1 1 0	0 0 1		A_3^2
$x_4^2(t)$	0 0 0	1 1 1		A_4^2
$x_5^2(t)$	0 0 1	1 1 0		A_5^2

() , r_e , m_1 , r_e () () ()

$r_e \leq m_1$ (12.15)

12.3.

			2

2

12.4.

()	u_4 u_5 z_7			
e_1^2	1 1			A_3^2, A_4^2, A_5^2

2

	1	
e_2^2	0 1 1	A_2^2, A_4^2, A_5^2
e_3^2	1 0 1	A_1^2, A_4^2, A_5^2

$x_5^3(t)$	0 0 0	1 1 1	A_5^3
$x_6^3(t)$	0 0 1	1 1 0	A_6^3

(12.14), $m_3 * r_e = 2 * 9 = 18$,
 (12.14), $m_2 * r_e = 3 * 3 = 9$,
 (12.14), $m_1 * r_e = 3 * 1 = 3$,
 12.11), , 18 .

12.5.

	z_8 z_9 z_{11}	z_8 z_9 z_{11}	A_1^3
$x_i^3(t)$			
$x_0^3(t)$	0 0 0	1 1 1	A_0^3
$x_1^3(t)$	1 0 0	0 1 1	A_1^3
$x_2^3(t)$	0 1 0	1 0 1	A_2^3
$x_3^3(t)$	1 1 0	0 0 1	A_3^3
$x_4^3(t)$	0 0 1	1 1 0	A_4^3

12.6.

	u_8 u_9 u_{11}	A_1^1
e_1^3	1 0 1	A_1^3, A_4^3
e_2^3	0 1 1	A_2^3, A_4^3
e_3^3	1 1 1	A_3^3, A_4^3
e_4^3	1 0 0	A_1^3, A_5^3
e_5^3	0 1 0	A_2^3, A_5^3
e_6^3	1 1 0	A_3^3, A_5^3
e_7^3	1 0 1	A_1^3, A_6^3

e_8^3	0 1 1	A_2^3, A_6^3
e_9^3	1 1 1	A_3^3, A_6^3

$(R_{i \geq 1})$

() .

. 12.12.

(. 12.12)

u_i

()

z_i

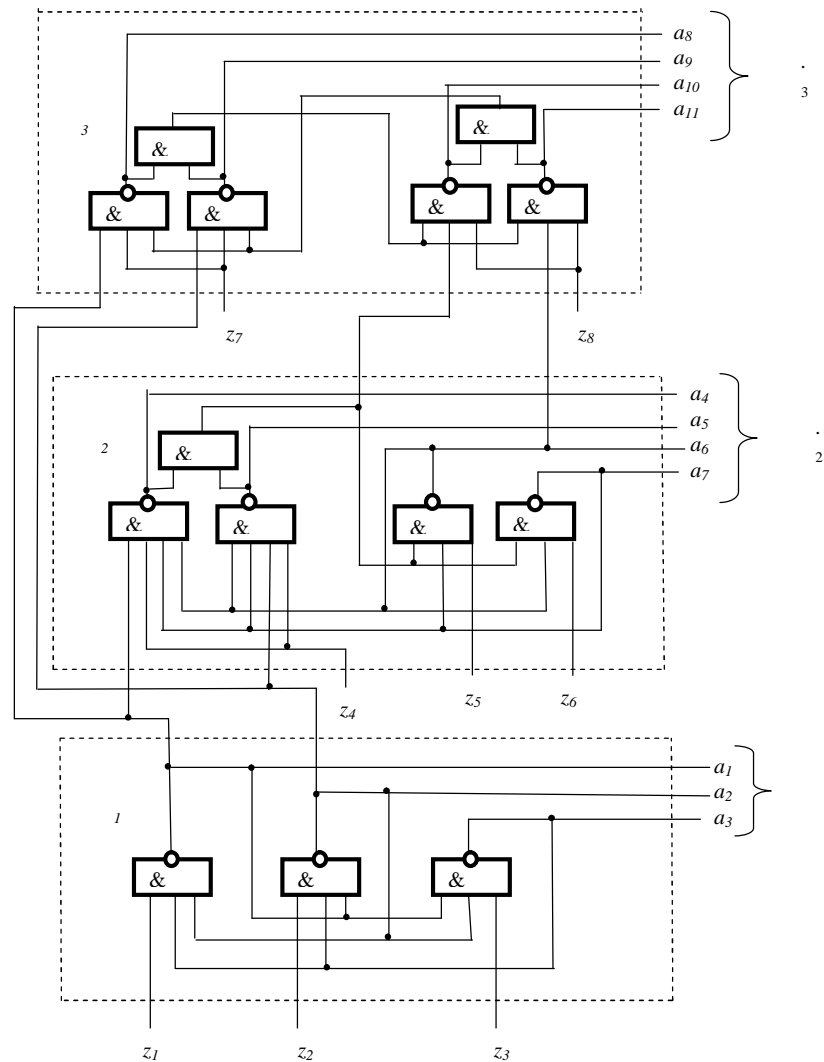
. 12.12.

18,

(. 12.12),

12.7,

12.8.



. 12.12.

12.7.

		1 2 3 4 5 6 7 8 9
		0 11
1	$A_1^1,$ A_2^2, A_2^3	0 1 1 1 0 1 1 1 0 1
2	$A_1^1,$ A_5^2, A_5^3	0 1 1 1 0 1 1 1 1 1
3	$A_1^1,$ A_4^2, A_4^3	0 1 1 1 1 0 1 1 0 1
4	$A_1^1,$ A_4^2, A_4^3	0 1 1 1 1 0 1 1 1 0
5	$A_1^1,$ A_5^2, A_5^3	0 1 1 1 1 1 0 1 0 1
6	$A_1^1,$ A_5^2, A_6^3	0 1 1 1 1 1 0 1 1 0
7	$A_2^1,$ A_1^2, A_1^3	1 0 1 0 1 1 1 0 1 1
8	$A_2^1,$ A_1^2, A_5^3	1 0 1 0 1 1 1 1 1 1
9	$A_2^1,$ A_4^2, A_1^3	1 0 1 1 1 0 1 0 1 1
10	$A_2^1,$ A_4^2, A_4^3	1 0 1 1 1 0 1 1 1 0
11	$A_2^1,$ A_5^2, A_1^3	1 0 1 1 1 1 0 0 1 1
12	$A_2^1,$ A_5^2, A_6^3	1 0 1 1 1 1 0 1 1 0
13	$A_3^1,$ A_3^2, A_3^3	1 1 0 0 0 1 1 0 0 1
14	$A_3^1,$ A_3^2, A_5^3	1 1 0 0 0 1 1 1 1 1
15	$A_3^1,$ A_4^2, A_3^3	1 1 0 1 1 0 1 0 0 1
16	$A_3^1,$ A_4^2, A_4^3	1 1 0 1 1 0 1 1 1 0

17	$A_3^1,$ A_5^2, A_3^3	1 1 0 1 1 1 0 0 0 1
18	$A_3^1,$ A_5^2, A_6^3	1 1 0 1 1 1 0 1 1 0

() ,
 $z_i (i=1, 2, \dots, 8)$
 18 ,
 = (t), () 18.
 ,
 $Y_i (i=1, 2, 3, 4),$
 ,
 ,
 3 ()
 j
 2 i
 () .

12.8.

	$z_1 z_2 z_3 z_4 z_5 z_6$	
	z_8	
x_1	1 0 0 1 0 0 0	A_1
x_2	1 0 0 1 0 0 1	A_2
x_3	1 0 0 0 1 0 0	A_3
x_4	1 0 0 0 1 0 1	A_4
x_5	1 0 0 0 0 1 0	A_5

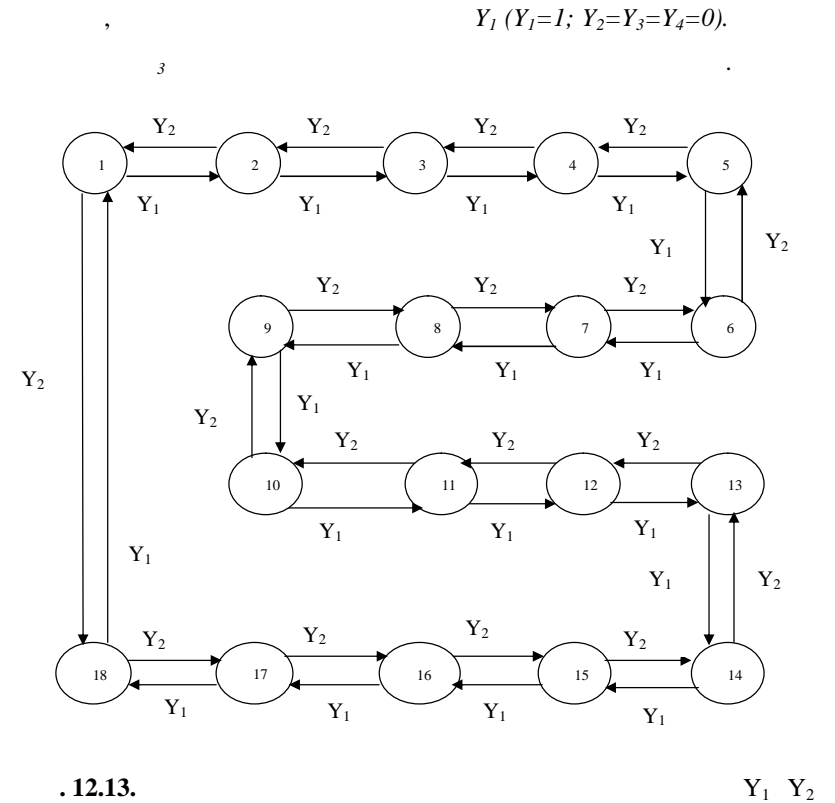
x_6	1 0 0 0 0 1	A_6
	1	
x_7	0 1 0 1 0 0	A_7
	0	
x_8	0 1 0 1 0 0	A_8
	1	
x_9	0 1 0 0 1 0	A_9
	0	
x_{10}	0 1 0 0 1 0	A_{10}
	1	
x_{11}	0 1 0 0 0 1	A_{11}
	0	
x_{12}	0 1 0 0 0 1	A_{12}
	1	
x_{13}	0 0 1 1 0 0	A_{13}
	0	
x_{14}	0 0 1 1 0 0	A_{14}
	1	
x_{15}	0 0 1 0 1 0	A_{15}
	0	
x_{16}	0 0 1 0 1 0	A_{16}
	1	
x_{17}	0 0 1 0 0 1	A_{17}
	0	
x_{18}	0 0 1 0 0 1	A_{18}
	1	

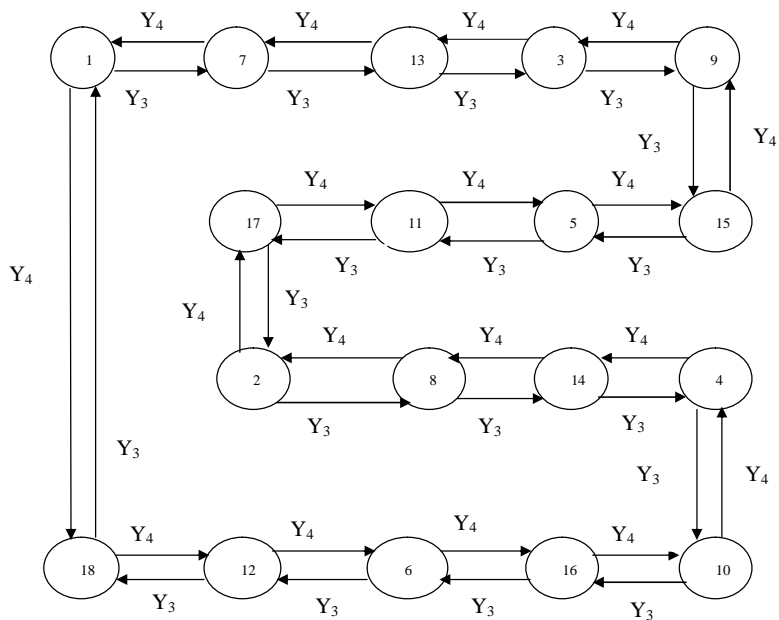
. 12.14.

. 12.15

18.

$Y_i (Y_1, Y_2, Y_3, Y_4)$





.12.14.

Y_3 Y_4

$+1$ (. 12.13).

(. 12.6).

(. 12.4).

Y_1 Y_2

($=1, 2, 3$)

(.12.8)

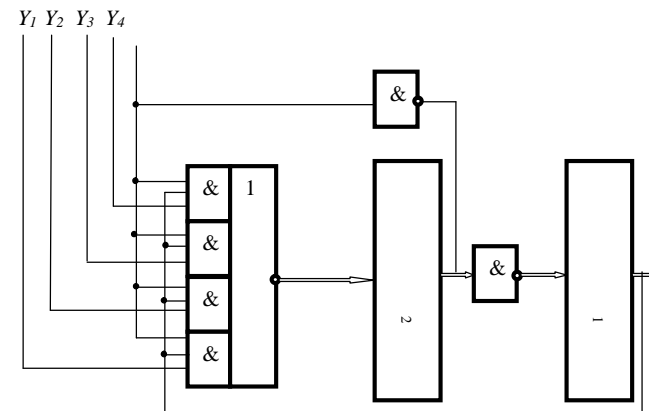
e_j (. 12.2, 12.4, 12.6),

(. 12.12).

($Y_3=1$)

($Y_4=1$)

. 12.14.



. 12.15.

e_j ()

(

μ

$x_i(t)$

e_j ()

()

18 (. 11.9).

12.9.

	K	n_Q	S	S	L	R
18	18	18	306	36	1	18
18	4	5	30	19	0,77	14

- K - (-);
- n_Q - (-);
- S - ;
- S - ;
- L - ;
- R - (-).

-4

12.3.

1. ?
2. ?
3. ?
4. ?
5. ?
6. ?
7. ?
8. ?
9. ? (,)

10. ()

?

11. ?
12. ?
13. .
14. ?
15. ?
16. .
17. ?
18. ?
19. ?
20. ?
21. ?
22. .
23. ?
24. ?
25. , .
26. .
27. .
28. , .
29. ,
30. ? ,
31. ? ,

13.

... () ...
 [1-11, 13-15, 17, 22-36],
 [12, 18-21].
 ... () ...
 ... () ...

() ...
 RS- ... RS-
 $r_x - x_i(t)$
 $e_j()$

[12]:

$$M = \sum_{l=1}^m K_l, \quad (13.1)$$

1. [21, 45].
2. [47].

$r_x(t)$ L
 $r_x = M + I$
 $M -$
 $I - (t)$
 $r_k()$
 $k(2 \leq k \leq m)$

13.1.

[11].
 ... () ...
 ...)

$$r_k = \sum_{j=1}^{C_m^K} \sum_{i=1}^K (\prod_{i=1}^{R_i} (2^{R_i-1})), \quad (13.2)$$

$C_m^K - m$;
 $m -$;
 $R_i -$;
 $r_e ()$

$$r_e = \sum_{k=2}^m r_k. \tag{13.3}$$

[45].

RS-

11,

RS-

: $r_2=2; r_3=3; r=1$.

RS-

($R=S=0$)

(-)

9,

(

10),

).

($n \geq 2$),

$m(2 \leq m \leq n)$

n

n

$n = 2 -$

11 (

RS-);

$n = 3 -$

: 12, 111.

12

21 () ;

$n = 4 -$

: 22, 13, 112, 1111;

$n = 5 -$ 6

: 14, 23, 113, 122, 1112, 11111

, r_x, r_t

n

$\log_{12} M$ n M .

1990

[45].

1)

$x_i(t)$

$r -$

$e_j()$

, $r_x -$

;

2)

-, - -) , ,

3)

, $x_i(t)$ $A_i(t)$ $e_j(t)$,
 j j

L

L L^M .

()

L

L^M

L

(1)

(1)

()

13.1.

	22	13	23	14	113
	6	8	10	16	9
	7	9	11	17	10
	9	7	21	15	7

5.

$$\begin{aligned}
 K &\geq m + 1; \\
 P1 &\geq 2; \\
 R &\geq \max(R_i); \\
 P2 &\geq \sum_{i=2}^m R_i + 1
 \end{aligned}
 \tag{13.5}$$

13 (. 13.1)

$$=5; \quad I=4; \quad R=3 \quad P2=4$$

L L ,

13.1.

7.

22 13 (.. 13.1),

22,

[21].

13, .. 13.1.

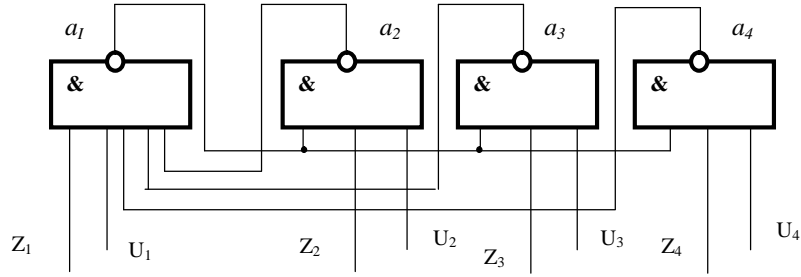
(. 13.1-13.2).

$$\begin{aligned}
 K &\geq \sum_{i=2}^m R_i + 2; \\
 P1 &\geq \sum_{i=2}^m R_i + 1,
 \end{aligned}
 \tag{13.4}$$

m -

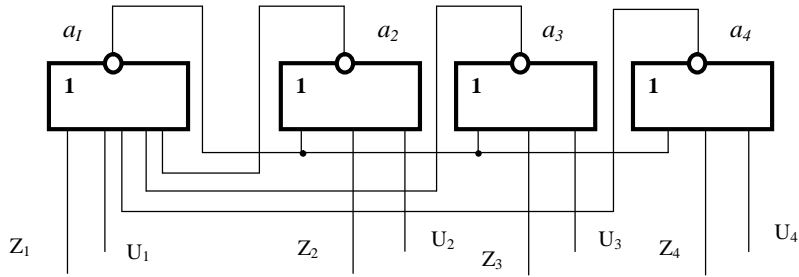
R_i -

L



. 13.1.

L



. 13.2.

L

[12].

$\tau_1, \tau_2, \bar{\tau}_1, \bar{\tau}_2$ [5, 11, 31].

$\tau_1, \tau_2, \bar{\tau}_1, \bar{\tau}_2$.

\emptyset .

[21]:

1) $(-1) \dots (-1)b -$

2) $\dots, A_{r-2}, \dots, A_0 -$

3) $(=0, 1, 2) -$

4) $(=1, 2) -$

$f(\dots)$

$f(\dots)$

$2, 22, 112, 111, \emptyset, 1,$

2 -

22 -

$L_N;$

2

(13.6)

4-

;

112 - , 4- $M = \prod_{i=1}^K m_i,$ (13.9)

, -2 ; , 1
 111 - , 3- $m (=1, 2, \dots,) -$
 , 1 ;

$\emptyset -$, ;
 1 - , .
 $L_N^B,$ (13.9) , L_N (13.6) L_N^B (13.7)
 $L_N,$: 18 (= 2*3*3 = 18).
 1b, 22, 111, 111, \emptyset , 1c, (13.7)

2 - $L_N^B;$
 22 - , 4-
 , 2 ; 0.

111 - , 3-
 , 1 ;
 $\emptyset -$, ;

1 - , .
 , , r_e (13.10)
 $r_e -$ ()

[21].

, ,
 , ()
 , (13.9)

$M = m_k * r_e$ (13.8)

$m_k -$;
 $r_e -$ $f()$,
 , I, R- 2,

L_N

L_N

(13.4) (13.5),

$$P1 \geq \sum_{i=2}^m R_i + K, \tag{13.11}$$

[6, 31].

$R_i -$

$$K_b \geq \sum_{i=2}^m R_i + K, \tag{13.12}$$

$R_i -$

()

r_e

(13.8),

$$K_b \geq m + K. \tag{13.13}$$

r_e

(13.2) (13.3)

(13.9).

()

13.2.

:

[21]:

1) (-

(13.8);

2) ,

(13.9);

3) ()

[31].

(13.11), (13.12) (13.13);

4) ,

5) ; [46].

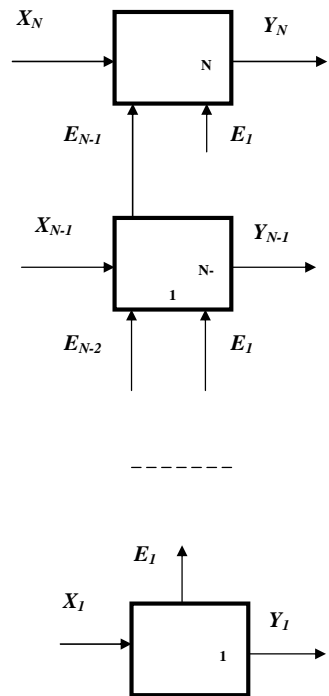
6) (),

[20].

[45].

[18, 19].

(. 13.3).



. 13.3.

13.4.

() , ()
 10) , ()
 18 ') ;
) , (23%);
) (10)
) , (,
) , [18-20].
 = $t_i + i$,
 (,) .
 , , () ,

17.

18.

14.

() ,
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14.1.

1

	§1.5	§2.4	§3.3	§4.3
1	1, 16	1, 16	1, 16	1, 16
2	2, 17	2, 17	2, 17	2, 17
3	3, 18	3, 18	3, 18	3, 18
4	4, 19	4, 19	4, 19	4, 19
5	5, 20	5, 20	5, 20	5, 20
6	6, 21	6, 21	6, 21	6, 21
7	7, 22	7, 22	7, 22	7, 22
8	8, 23	8, 23	8, 23	8, 23
9	9, 24	9, 24	9, 24	9, 24
10	10, 25	10, 25	10, 25	10,25
11	11, 26	11, 26	11, 26	11,26
12	12, 27	12, 27	12, 27	12,27
13	13, 28	13, 28	13, 28	13
14	14, 29	14, 29	14, 29	14,29
15	15, 30	15, 30	15, 30	15,30

14.2.

1.

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1.

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6.

1.

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2^n

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- 4.
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- 2, 3 4
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- 5.
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- .

n	b	\bar{b}	
a	1	1	1
\bar{a}	1	0	0
	1	1	1

1

		d	\bar{d}	

2

n	b	\bar{b}	
a			
\bar{a}			
n	b	d	\bar{b}
a			
\bar{a}			
n	b	d	\bar{b}
a			

3

4

\bar{a}				
			d	

5

	n	b	\bar{b}	
4				
	a			
	\bar{a}			
	n	b	\bar{b}	
4			d	
	a			
	\bar{a}			
	n	b	d	\bar{b}
4				
	a			

6

7

\bar{a}				
			d	

8

	n	b	\bar{b}	
4				
	a			
	\bar{a}			
			d	

9

	n	b	\bar{b}	
4				
	a			
	\bar{a}			

		d	
--	--	-----	--

10

4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		
4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		

11

12

13

4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		
	n	b	\bar{b}	
4				
	a			
	\bar{a}			
		d		

14

4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		

15

16

4	n	b	\bar{b}	
a				
\bar{a}				
		d		
	n	b	\bar{b}	
4				
a				
\bar{a}				
		d		
	n	b	\bar{b}	
4				
a				
\bar{a}				
		d		

17

18

19

4	n	b	\bar{b}	
a				
\bar{a}				
		d		
	n	b	\bar{b}	
4				
a				
\bar{a}				
		d		
	n	b	\bar{b}	
4				
a				
\bar{a}				
		d		

20

21

22

4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		
4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		
4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		

23

24

25

4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		
4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		
4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		

26

27

28

n	b	\bar{b}	
4			
a			
\bar{a}			
		d	
n	b	\bar{b}	
4			
a			
\bar{a}			
		d	
n	b	\bar{b}	
4			
a			
\bar{a}			
		d	

29

30

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14.

15.

14.3.

2.

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n	b	\bar{b}	
4			
a			
\bar{a}			
		d	

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- 1.
- 2.
- 3.
- 4.
- 5.

- 1.
- 2.
- 3.
- 4.

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1

	n	b	\bar{b}		
4					
	a				
	\bar{a}				
			d		
4	n	b	\bar{b}		
	a	1	1	1	1
		0	1	1	0

2

	0	1	1	0	
\bar{a}	1	1	1	1	
	\bar{d}	d		\bar{d}	

3

4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		
4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		

4

5

n	b	\bar{b}	
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4				
a				
\bar{a}				
		d		

6

4	n	b	\bar{b}	
a				
\bar{a}				
		d		
	n	b	\bar{b}	
4				
a				
\bar{a}				
		d		

7

8

4	n	b	\bar{b}	
a				
\bar{a}				
		d		
	n	b	\bar{b}	
4				
a				
\bar{a}				
		d		

9

10

4	n	b	\bar{b}	
a				
\bar{a}				
		d		

11

12

4	n	b	\bar{b}	
	a			
	\bar{a}			
4	n	b	d	\bar{b}
	a			
	\bar{a}			
			d	

13

4	n	b	\bar{b}	
	a			
	\bar{a}			
			d	

14

4	n	b	\bar{b}	
	a			
	\bar{a}			
			d	
4	n	b	\bar{b}	
	a			
	\bar{a}			
			d	

15

16

4	n	b	\bar{b}	
	a			
	\bar{a}			
			d	

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17

4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		

18

4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		

19

4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		

20

4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		

21

22

4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		

23

4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		

24

4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		

25

4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		

26

4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		

27

4	n	b	\bar{b}	
	a			
	\bar{a}			
		d		

28

4	n	b	\bar{b}	
	a			
	\bar{a}			
			d	
4	n	b	\bar{b}	
	a			
	\bar{a}			
			d	

29

4	n	b	\bar{b}	
	a			
	\bar{a}			
			d	

30

5.

(0, 0.5, 1).

6.

7.

8.

14.4.

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1.

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2.

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3.

4.

5.

3.

4	n	b	\bar{b}	
	a			
	\bar{a}			
			d	

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12. .
13. .
14. .
15. .
16. .

14.5.

2

	\$5.3	\$6.5	\$7.5	\$8.3
1	1, 16	1, 16	1, 16	1, 16
2	2, 17	2, 17	2, 17	2, 17
3	3, 18	3, 18	3, 18	3, 18
4	4, 19	4, 19	4, 19	4, 19
5	5, 20	5, 20	5, 20	5, 20
6	6, 21	6, 21	6, 21	6, 21
7	7, 22	7, 22	7, 22	7, 22
8	8, 23	8, 23	8, 23	8, 23
9	9, 24	9, 24	9, 24	9, 24
10	10, 25	10, 25	10, 25	10,25
11	11, 26	11, 26	11, 26	11,26
12	12, 27	12, 27	12, 27	12,27
13	13, 28	13, 28	13, 28	13
14	14, 29	14, 29	14, 29	14,29
15	15, 30	15, 30	15, 30	15,30

14.6.

4.

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RS-

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14.7.

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1.

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(t)

6.

f()

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11.

12. r_x (t)

13. r_e ()

14. : , .

4. L -

6 .

5. L^M -

6 .

6. 6 .

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8. 6

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14.8. 6. ,

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1. .

2. 18 .

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14.9. 7.

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- 11.
- 12. ?
- 13. ?
- 14. ?
- 2. $n=3.$
- 3. $n=3.$
- 4. $n=3.$
- 5. - - .
- 6.
- - .
- 7.
- 8.
- 9.

14.10.

3

	§9.4	§10.3	§11.3
1	1, 16	1, 16	1, 16
2	2, 17	2, 17	2, 17
3	3, 18	3, 18	3, 18
4	4, 19	4, 19	4, 19
5	5, 20	5, 20	5, 20
6	6, 21	6, 21	6, 21
7	7, 22	7, 22	7, 22
8	8, 23	8, 23	8, 23
9	9, 24	9, 24	9, 24
10	10, 25	10, 25	10, 25
11	11, 26	11, 26	11, 26
12	12, 27	12, 27	12, 27
13	13, 28	13, 28	13, 28
14	14, 29	14, 29	14, 29
15	15, 30	15, 30	15, 30

14.11.

8.

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14.12.

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1. ... : .
.- : ,2003. – 180 .
2. ... ,1977. –
400 .
3. / ... ,
1976. – 423 .
4. ... ,1978. – 109 .
5. : (-
).- : ,1979. – 232 .
6. ... ,1975. – 368 .
7. ... ,
1985. – 288 .
8. ... ,1963. – 440 .
9. ... ,1977. – 352 .
10. ... ,1962. –
476 .
11. ... ,1987. – 264 .
12. / ... ,
1987.- 244 . .30.12.87, 3346– 87.
13. ... (...). – : , 1977. –
240 .

14. ... – : ,
1981. – 416 .
15. ... ,
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16. ... : .
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17.- :
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20. – :
 - 6.-1996.- .59-69
21.
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22. ... ,
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61.
23. ... / ... , ... , ...
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- 29. - 2-
 - : . , 1982. -279 .
- 30. - :
 , 1987. - 375 .
- 31. : (.) / , /
 . - : . , 1979. - 366 .
- 32. : / - :
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- 33.
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- 34. - :
 , 2002.
- 35.
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- 36. - : . , 1973. - . 1
 - 240 . ; 1974. - . 2. - 477 .
- 37. - :
 , 1970. - 47 .
- 38. - : -
 . - , 1975. - 280 .
- 39. : . - 2-
 . , . - : . , 1989. - 352 .
- 40. // ,
 1976. - 2. . 1-15.
- 41. // . - . , 1974. - . 5-49.
- 42. - : . , 1976. - 165 .
- 43. - : . , 1986. - 150 .
- 44. /
 - : . - , 1980. - 13
 28. 07.81, 21/4059.
- 45. //
 . - : . , 1990. - . 51. - . 57-61.
- 46. ,
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 , - : « » ,
 1998. - . 274-281.

47.

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.- .: , 1989. - . 20-22.

0,5 5,0 .

$$n = \sqrt{\frac{\max}{\min}} + 3 = \sqrt{\frac{5,0}{0,5}} + 3 = 6.$$

0,5 , - 5,0 .

$$= \frac{\max - \min}{n - 1} = \frac{5,0 - 0,5}{6 - 1} = 0,9$$

=0,9

1,0 .

$$= \min + (-1),$$

$$_1 = 0,5$$

$$_2 = 0,5 + 1,0 = 1,5$$

$$_3 = 0,5 + 2 = 2,5$$

$$_4 = 0,5 + 3 = 3,5$$

$$_5 = 0,5 + 4 = 4,5$$

$$_6 = 5,0 .$$

- , : 0,5; 1,5; 2,5; 3,5; 4,5; 5,0

- , .: 0,16; 0,18; 0,23; 0,26; 0,28; 0,30.

() ; -

() .

(,) :

$$X_{cp} = \frac{0,5 + 1,5 + 2,5 + 3,5 + 4,5 + 5,0}{6} = \frac{17,5}{6} = 2,92;$$

$$= \frac{0,16 + 0,18 + 0,23 + 0,26 + 0,28 + 0,30}{6} = \frac{1,41}{6} = 0,23$$

(' , ') :

$$X' = \frac{3,5 + 4,5 + 5,0}{3} = \frac{13}{3} = 4,33;$$

$$' = \frac{0,26 + 0,28 + 0,30}{3} = \frac{0,84}{3} = 0,28$$

('' , '') :

$$'' = \frac{0,5 + 1,5 + 2,5}{3} = \frac{4,5}{3} = 1,50;$$

$$'' = \frac{0,16 + 0,18 + 0,23}{3} = \frac{0,57}{3} = 0,19.$$

(. 8).

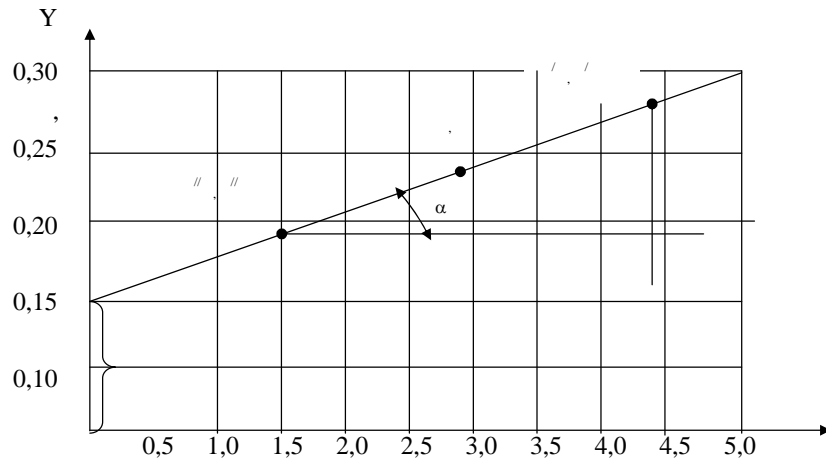
= + ,

- , α;

$$a = \operatorname{tg} \alpha = \frac{I' - II'}{I - II} = \frac{0,28 - 0,19}{4,33 - 1,50} = \frac{0,09}{2,83} = 0,03,$$

" ", , 0,15.

$$= 0,03 + 0,15.$$



. 8.

$$a \sum_{i=1}^n X^2 + b \sum_{i=1}^n X = \sum_{i=1}^n XY$$

$$a \sum_{i=1}^n X + nb = \sum_{i=1}^n Y$$

a -

; b -

n -

X -

; Y -

, : 0,5; 1,5; 2,5; 3,5; 4,5; 5,0.

Y, ..: 0,16; 0,18; 0,23; 0,26; 0,28; 0,30.

.28.

28

		Y	X*Y	X ²
1	0,5	0,16	0,08	0,25
2	1,5	0,18	0,27	2,25
3	2,5	0,23	0,58	6,25
4	3,5	0,26	0,91	12,25
5	4,5	0,28	1,26	20,25
6	5,0	0,30	1,50	25,00
	17,5	1,41	4,60	66,25

$$66,25 + 17,5b = 4,60;$$

$$17,5a + 6b = 1,41.$$

"b" " ":

$$b = \frac{1,41 - 17,5a}{6} = 0,24 - 2,92a.$$

"b"

$$66,25 + 17,5(0,24 - 2,92) = 4,60.$$

$$15,5 = 0,4;$$

$$a = \frac{0,4}{15,5} = 0,03.$$

$$b = 0,24 - 2,92 \cdot 0,03 = 0,15.$$

$$Y=0,03 +0,15,$$

:

$$=0,03 +0,15.$$

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()

1)

2)

3)

4)

5)

6)

1926 . . . ("Motion –
Time Analysis", " "). 30-
"Work
Factor", ,
40- , .
" " ("Methods-Time Measurement"
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