$A° = 1\%$
$B° = 27\%$

$$\eta = 5 + \left(\frac{A}{0,2} - 5\right) \cdot \left(\frac{B}{3} - 9\right)$$

$\eta = [\text{усл. ед.}]$
$A = B = [\%]$

1 экспериментатор

$B = 24\%$

A,%	0,8	0,9	1,0	1,1	1,2
η, ус.ед.	6,0	5,5	5,0	4,5	4,0

$A = 0,8\%$

B %	24	25,5	27	28,5	30
η, усл.ед.	6	5,5	5	4,5	4,0

2 экспериментатор

$B = 27\%$

A,%	0,8	0,9	1,0	1,1	1,2
η, усл. ед.	5	5	5	5	5

$A = 1,0\%$

B,%	24	25,5	27	28,5	30
η, усл. ед.	5	5	5	5	5

3 экспериментатор

$B = 30\%$

A,%	0,8	0,9	1,0	1,1	1,2
η, усл. ед.	4	4,5	5,0	5,5	6,0

$A = 1,2\%$

B,%	24	25,5	27	28,5	30
η, усл. ед.	4	4,5	5	5,5	6,0

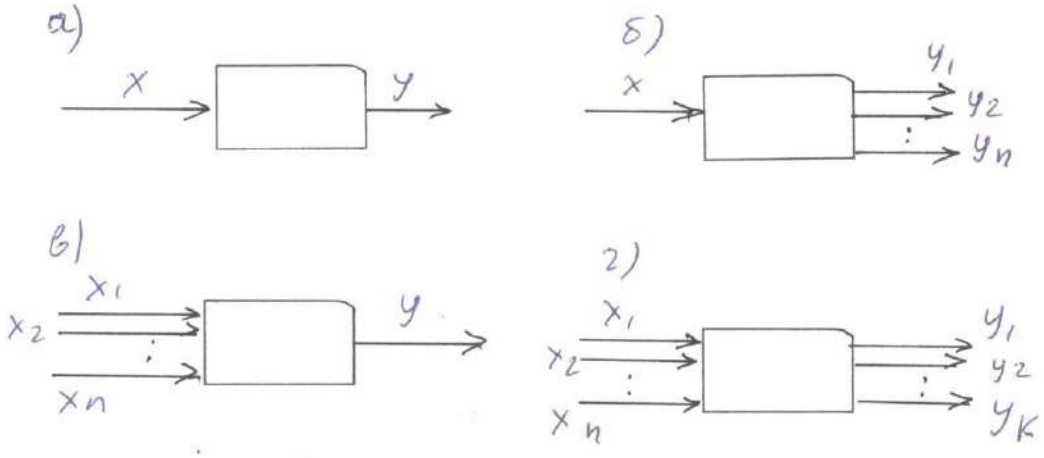


Рис. 1

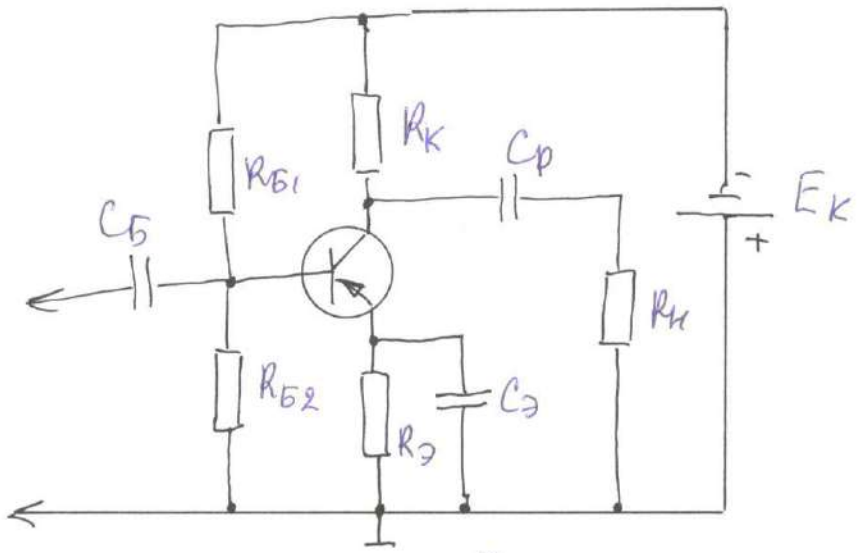


Рис. 2

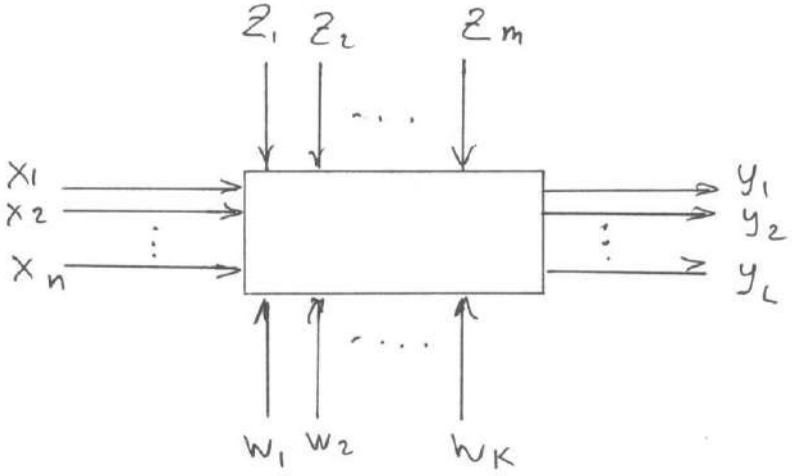
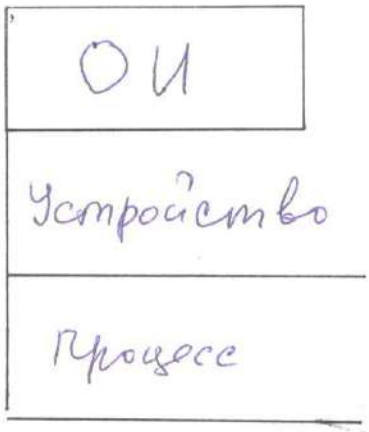


Рис. 3

Исследования

Экспериментальные



Теоретические

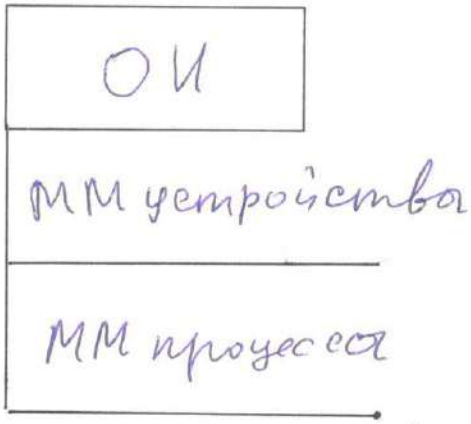
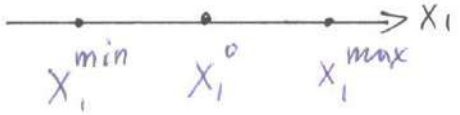


Рис. 4

Эксперимент

Однофакторный



Двухфакторный

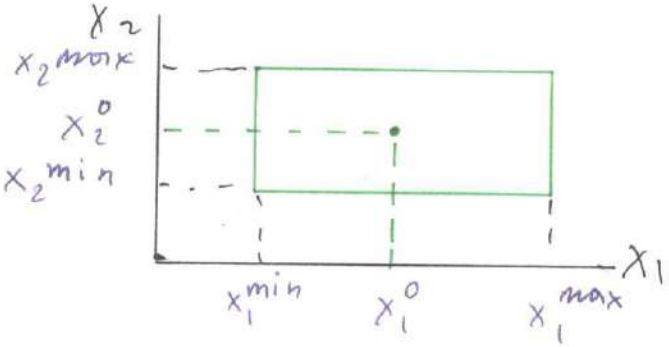


Рис. 5

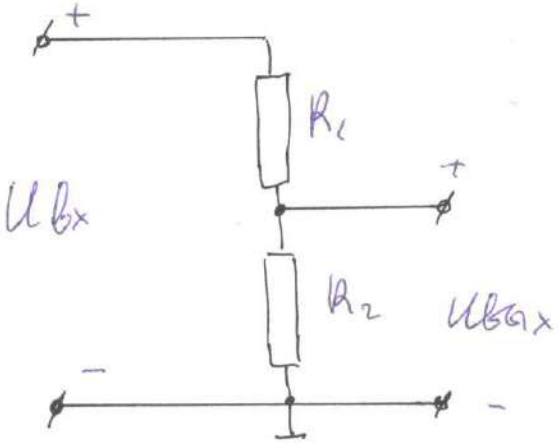


Рис. 6

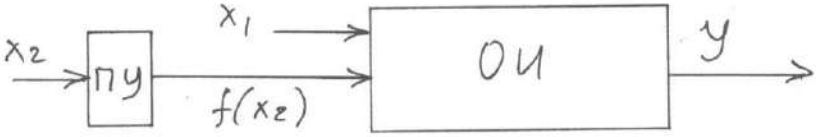


Рис. 7

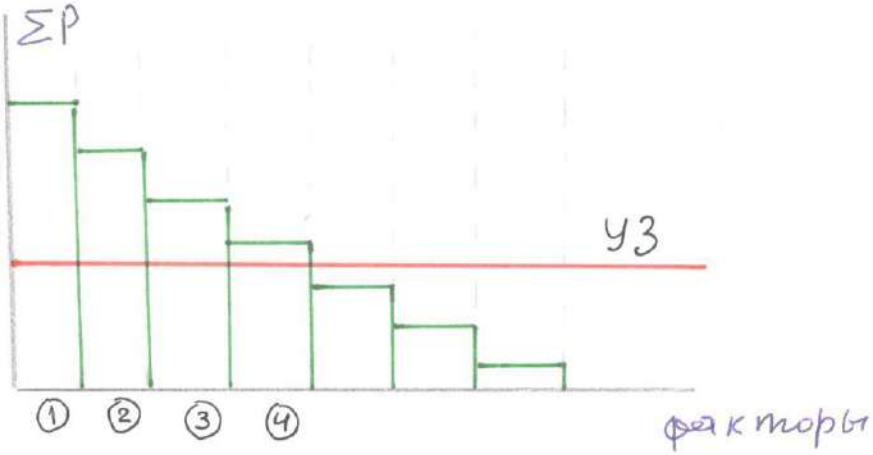


Рис. 8

№	x_1	x_2	... x_n	y_1	y_2	... y_K
1	m_{11}	m_{21}	... m_{n1}	y_{11}	y_{21}	... y_{K1}
2	m_{12}	m_{22}	... m_{n2}	y_{12}	y_{22}	... y_{K2}
⋮	⋮	⋮	⋮	⋮	⋮	⋮
N	m_{1N}	m_{2N}	m_{nN}	y_{1N}	y_{2N}	... y_{KN}

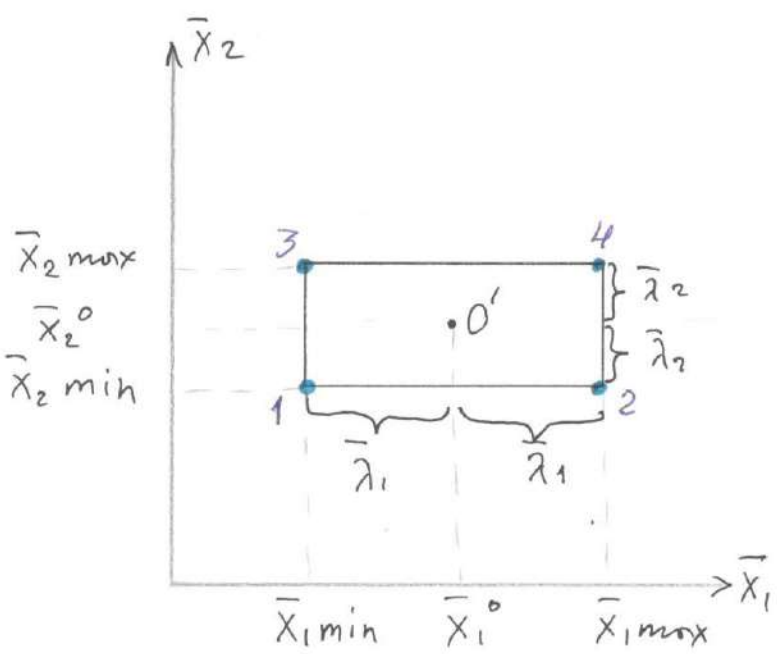
$$|y_{ij} - y_{kj}| \leq \Delta \quad (1)$$

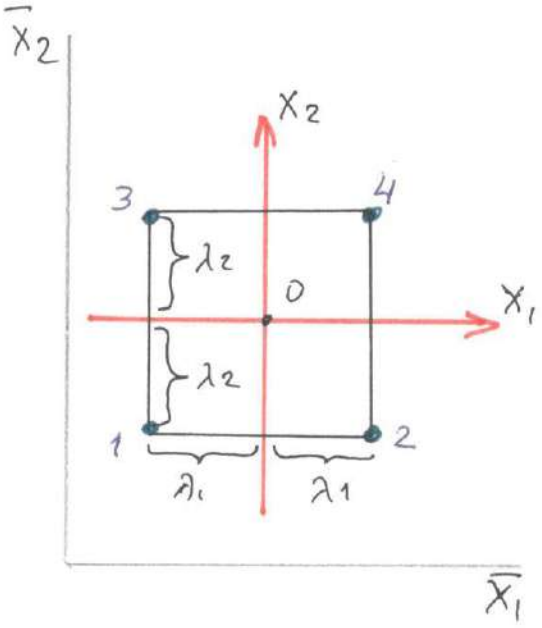
Рис. 9

$$\left.\begin{aligned} y_1 &= f_1(x_1, x_2^0, x_3^0, \ldots x_n^0) \\ y_2 &= f_2(x_1^0, x_2, x_3^0, \ldots x_n^0) \\ &\cdots\cdots\cdots\cdots \\ y_n &= f_n(x_1^0, x_2^0, x_3^0 \ldots x_n) \end{aligned}\right\} \quad (2)\ \text{ОФЭ}$$

$$\left.\begin{aligned} y_1 &= f_1(x_1, x_2, x_3, \ldots x_n) \\ y_2 &= f_2(x_1, x_2, x_3, \ldots x_n) \\ &\cdots\cdots\cdots\cdots \\ y_n &= f_n(x_1, x_2, x_3, \ldots x_n) \end{aligned}\right\} \quad (3)\ \text{ПФЭ}$$

Рис. 10



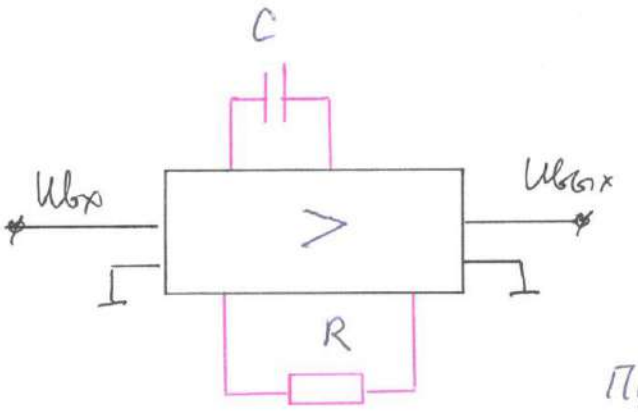


$$X_i = \frac{\bar{X}_i - \bar{X}_i^0}{\bar{\lambda}_i} \qquad (4)$$

№	$\bar{X}_1$	$\bar{X}_2$
1	$\bar{X}_{1\,min}$	$\bar{X}_{2\,min}$
2	$\bar{X}_{1\,max}$	$\bar{X}_{2\,min}$
3	$\bar{X}_{1\,min}$	$\bar{X}_{2\,max}$
4	$\bar{X}_{1\,max}$	$\bar{X}_{2\,max}$

№	X_1	X_2
1	−1	−1
2	+1	−1
3	−1	+1
4	+1	+1

Рис. 11



$$K_u = 40 + 5C - 3R + 0{,}5CR$$

15,0 20,0 25,0 — C 5,0

80 100 120 — 20 R

$$C = \frac{\bar{C}_1 - 20}{5} \qquad R = \frac{\bar{R} - 100}{20}$$

Пусть $\bar{C} = 10{,}0$ мкФ $\quad \bar{R} = 140$ Ом

$C = (10{,}0 - 20{,}0)/5 = -2$

$R = (140 - 100)/12 = 2$

$K_u = 40 + 5\cdot(-2) - 3\cdot 2 + 0{,}5\cdot(-2)\cdot 2 = 22$

Рис. 12

№	b_0 (x_0)	b_1 (x_1)	b_2 (x_2)	b_{12} (x_1x_2)
1	+	−	−	+
2	+	+	−	−
3	+	−	+	−
4	+	+	+	+

Рис. 13

№	b_0	b_1	b_2	b_{12}	y
1	+	−	−	+	y_1
2	+	+	−	−	y_2
3	+	-	+	-	y_3
4	+	+	+	+	y_4

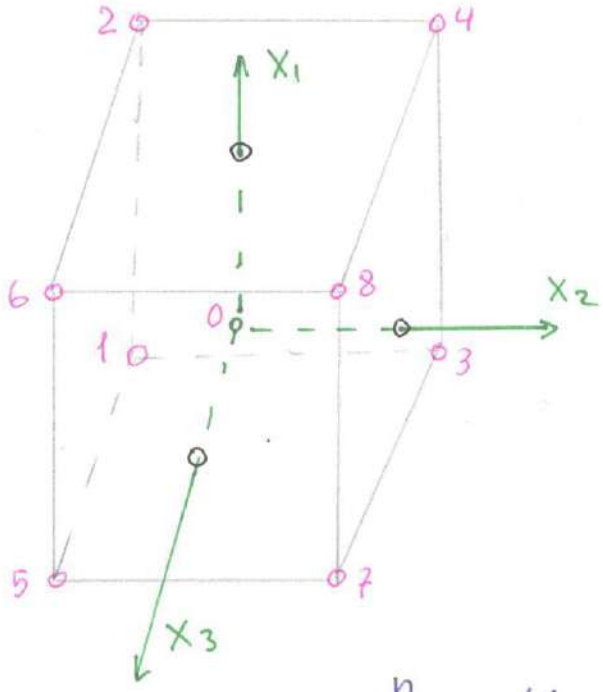
Рис. 14

$$y = b_0 + b_1 x_1 + b_2 x_2 + b_{12} x_1 x_2$$ (5)

№	x_1	x_2	x_3	x_1x_2	x_1x_3	x_2x_3	$x_1x_2x_3$	x_0	y
1	−	−	−	+	+	+	−	+	y_1
2	+	−	-	−	−	+	+	+	y_2
3	−	+	−	−	+	−	+	+	y_3
4	+	+	-	+	−	−	−	+	y_4
5	−	−	+	+	−	-	+	+	y_5
6	+	−	+	−	+	−	−	+	y_6
7	−	+	+	−	−	+	−	+	y_7
8	+	+	+	+	+	+	+	+	y_8

Рис. 15

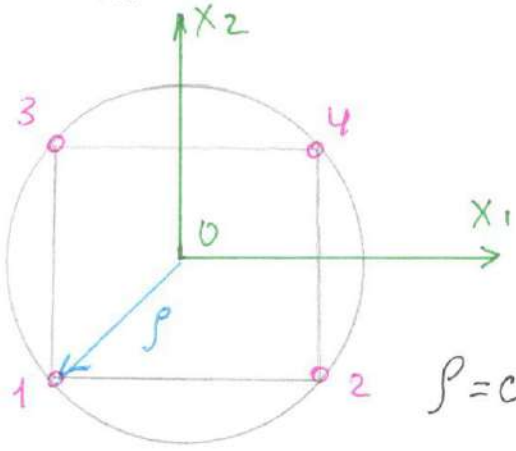
$$y = b_0 + b_1 x_1 + b_2 x_2 + b_{12} x_1 x_2 + b_3 x_3 + b_{13} x_1 x_3 + b_{23} x_2 x_3 + b_{123} x_1 x_2 x_3$$ (6)



T.	X_1	X_2	X_3
1	−	−	−
2	+	−	−
3	−	+	−
4	+	+	−
5	−	−	+
6	+	−	+
7	−	+	+
8	+	+	+

Рис. 16

$$S^2_{\hat{y}} = \frac{S^2_y}{N}\left(1+\rho^2\right) \qquad (7)$$



$\rho = const \rightarrow S^2_{\hat{y}} = const$

$$\sum_{i=1}^{N} X_{ji}\, X_{qi} = 0 \qquad (8)$$

$$j \neq q \qquad j, q = \overline{1, N}$$

$$\sum_{i=1}^{N} X_{ji} = 0 \qquad j = \overline{1, N} \qquad (9)$$

$$\sum_{i=1}^{N} X^2_{ji} = N \qquad j = \overline{1, N} \qquad (10)$$

Рис 17

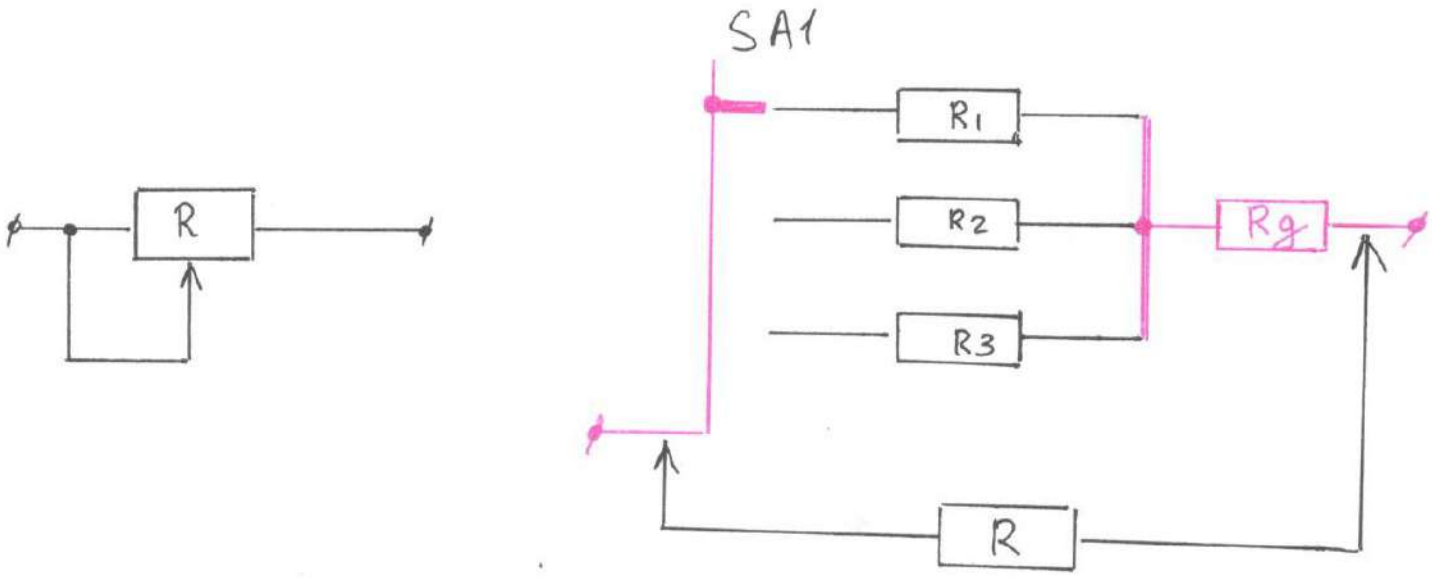


Рис. 18

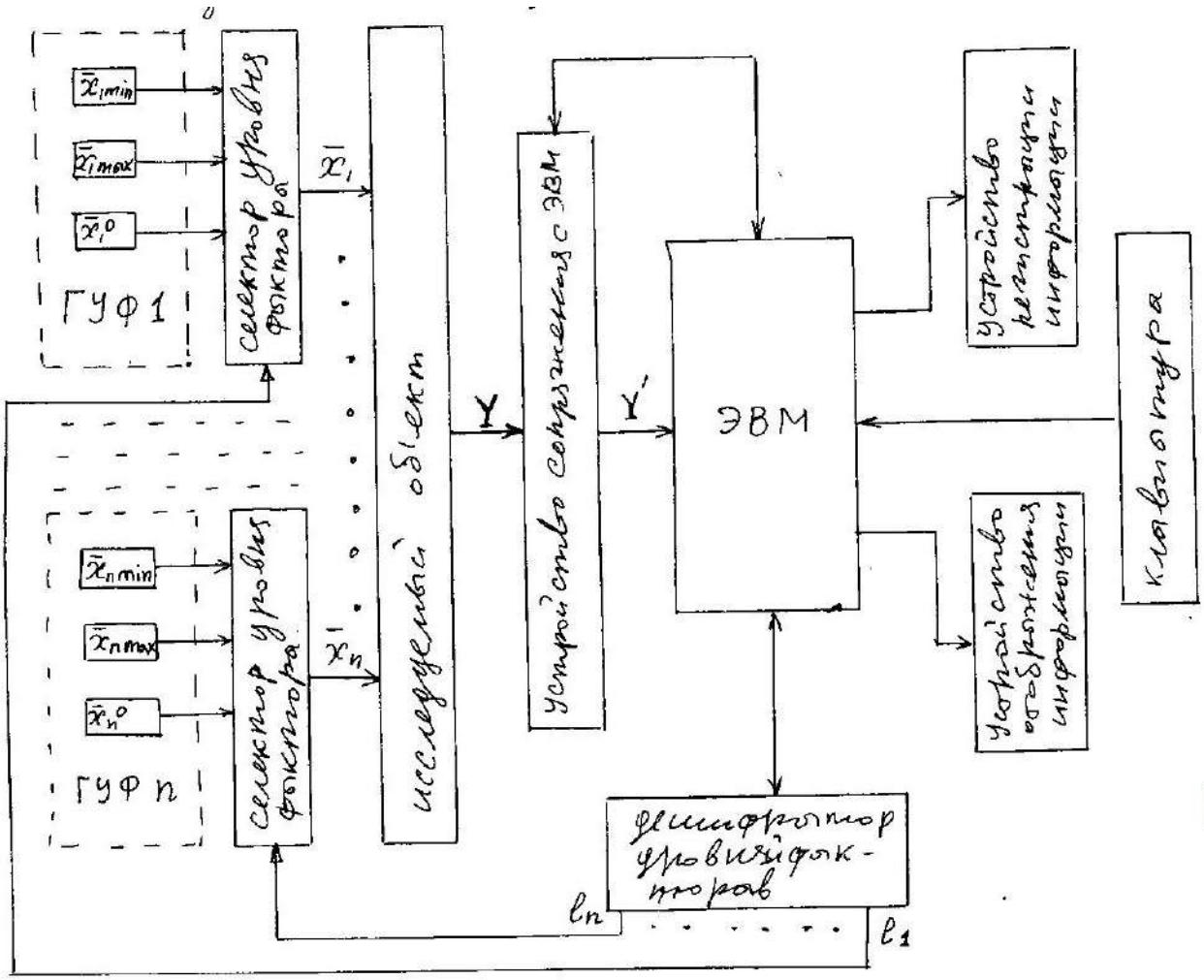

ГУФ 1
ГУФ n
селектор управляющих факторов
исследуемый объект
устройство сопряжения с ЭВМ
ЭВМ
устройство визуальной информации
клавиатура
дешифратор управляющих факторов

Рис. 19

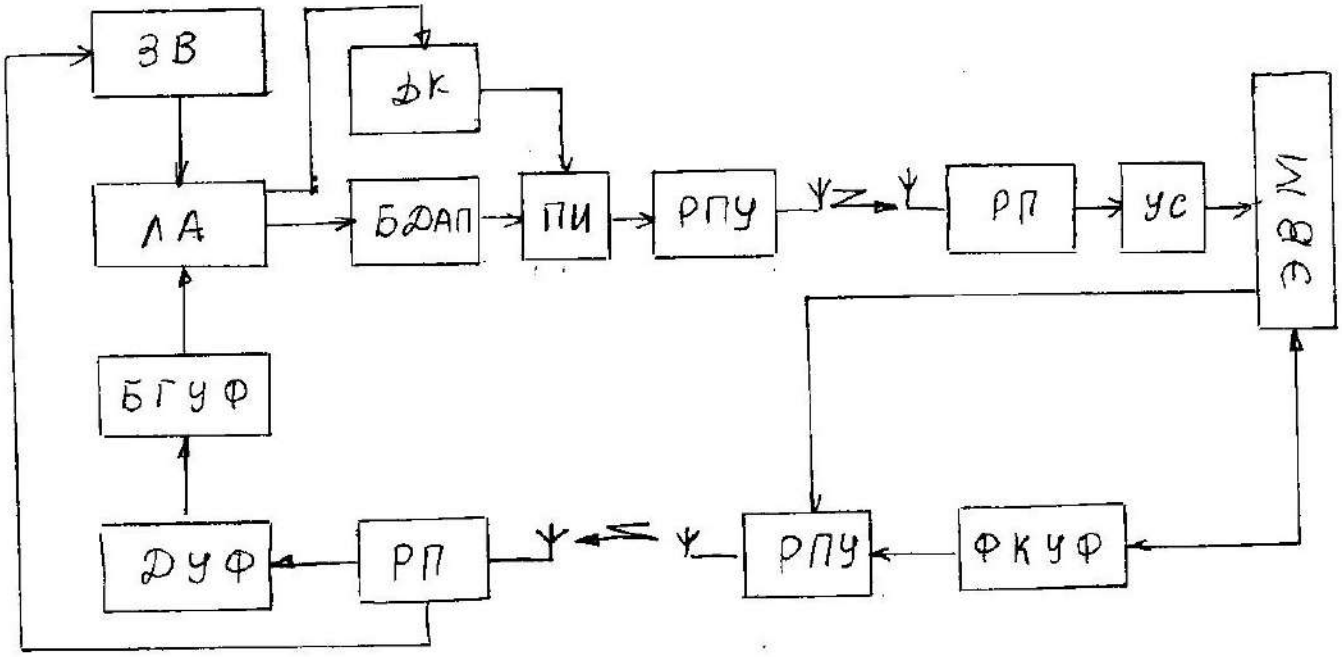


Рис. 20

№ опыта	x_{1i}	x_{2i}	....	x_{ni}	y_{i1}	y_{i2}	...	y_{im}
1	−	−	. . .	−	y_{11}	y_{12}	..	y_{1m}
2	+	−	. . .	−	y_{21}	y_{22}	..	y_{2m}
⋮	⋮	⋮	⋮		⋮	⋮	⋮	⋮
N	+	+	. . .	+	y_{N1}	y_{N2}	..	y_{Nm}

ПФЭ − 2^n $\quad n = 3 \quad N = 2^3 = 8 \quad m = 3, 5, 7 \ldots$

1. $\bar{y}_i = \frac{1}{m} \sum_{j=1}^{m} y_{ij}$ (11)

2. $S^2(y_i) = \frac{1}{m-1} \sum_{j=1}^{m} (y_{ij} - \bar{y}_i)^2$ (12)

3. $t_p = \frac{|y_i^* - \bar{y}_i|}{S(y_i)}$ (13) $\quad t_p \leq t_{кр}$

4. $G_p = \frac{S^2(y_{i\max})}{\sum_{i=1}^{N} S^2(y_i)}$ (14) $\quad G_p \leq G_{кр} \quad f_i = m - 1 \quad f_\Sigma = N$

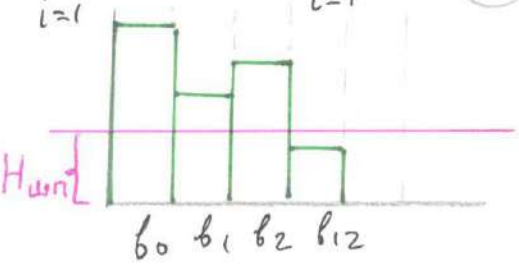
5. $S^2(y) = \frac{1}{N} \sum_{i=1}^{N} S^2(y_i)$ (15)

$S(y) = \sqrt{S^2(y)}$ (16)

6. $b_i = \frac{1}{N} \sum_{j=1}^{N} x_{ij} \cdot y_i$ (17) $\quad \sum_{i=1}^{N} y_i^2 = N \sum_{i=1}^{N} b_i^2$ (18)

7. $S^2(b_i) = \frac{S^2(y)}{N \cdot m}$ (19)

$|b_i| > S(b_i) \cdot t \; ; \; f = N(m-1)$



8. $S^2_{ag} = \frac{m \sum_{i=1}^{N} (\bar{y}_i - \hat{y}_i)^2}{N - \ell}$ (20)

$F_p = \frac{S^2_{ag}}{S^2(y)}$ (21) $\quad F_p \leq F_{кр} \quad f_y = N(m-1) \quad f_{ag} = N - \ell$

Рис. 21