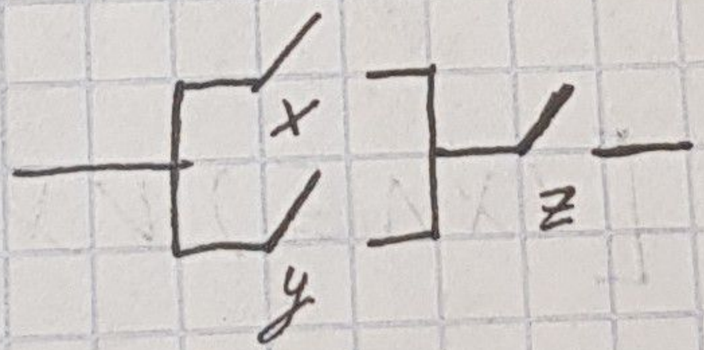
27.10.2020.

Применение алгебры высказываний к релейно-контактным схемам и логическим задачам.

Задание 1.

x	y	z	сост. схемы
0	1	1	1
1	0	1	1
1	1	0	0

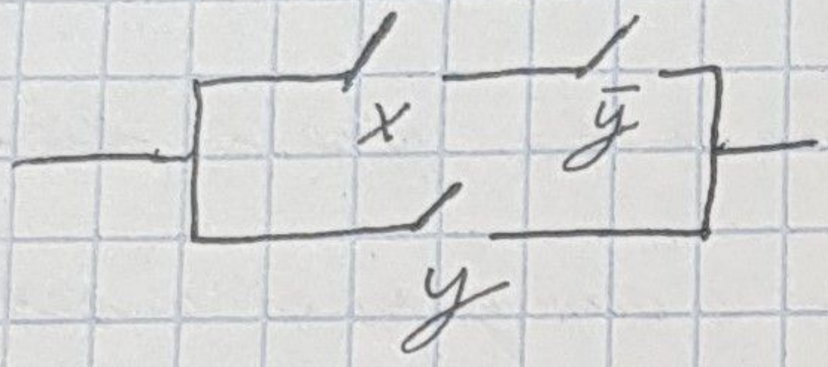


Задание 2. Составить функцию проводимости, упростить эту функцию и построить схему.

1)

$$f(x,y,z) = \Big(\big((x \wedge \bar{y}) \vee y\big) \wedge x\Big) \vee (x \wedge y \wedge z) \vee$$

$$\vee \Big(\big((\bar{z} \wedge \bar{y}) \vee (\bar{x} \wedge y)\big) \wedge (z \vee y)\Big) = (x \wedge \bar{y}) \vee y$$



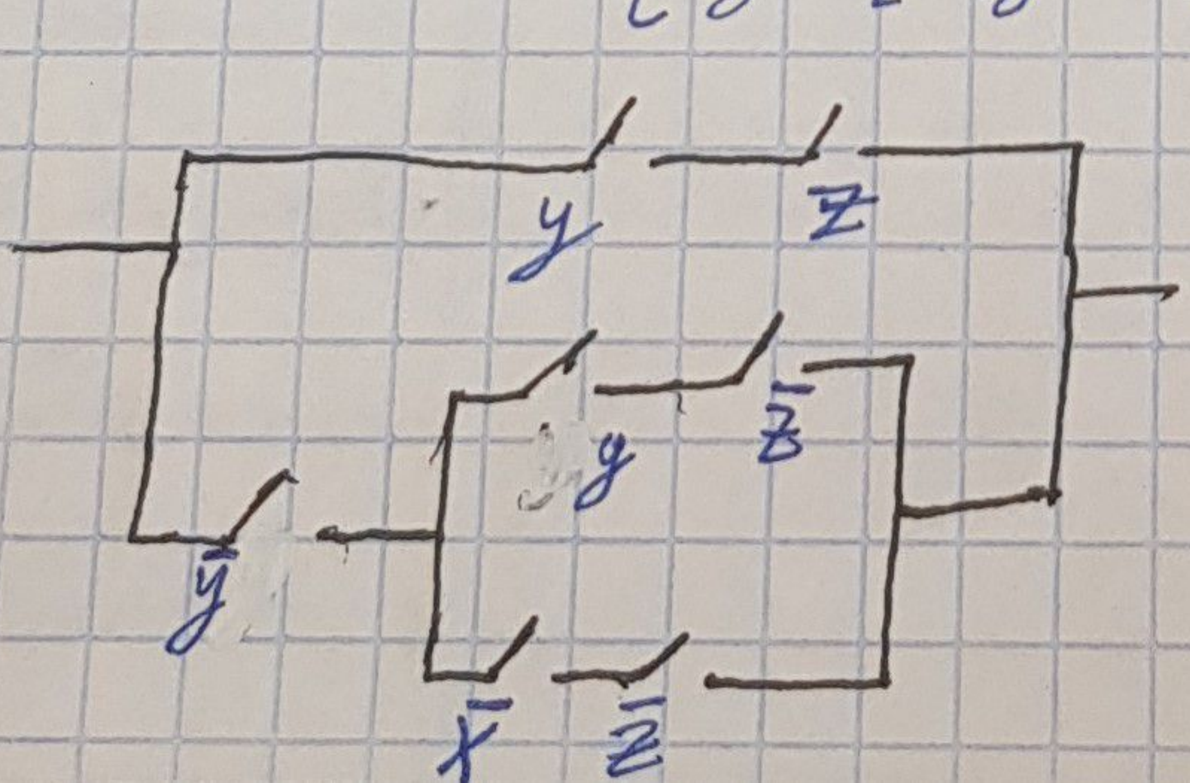
2)

$$f(x,y,z) = \Big\{\Big[\big(y \wedge (x \vee y) \wedge \bar{x}\big) \vee (y \wedge z)\Big] \wedge x\Big\} \vee$$

$$\vee \Big\{\bar{y} \wedge \big[(y \wedge \bar{z}) \vee (\bar{x} \wedge \bar{z})\big]\Big\} \vee$$

$$\vee \Big\{y \wedge z \wedge \big[(x \wedge \bar{z}) \vee \bar{x}\big]\Big\} =$$

$$= (y \wedge z) \vee \Big\{\bar{y} \wedge \big[(y \wedge \bar{z}) \vee (\bar{x} \wedge \bar{z})\big]\Big\}$$



1)

X	Y	Z	$\bar{x}$	$\bar{y}$	$\bar{z}$	$x \wedge \bar{y}$
0	0	0	1	1	1	0
0	0	1	1	1	0	0
0	1	0	1	0	1	0
0	1	1	1	0	0	0
1	0	0	0	1	1	1
1	0	1	0	1	0	1
1	1	0	0	0	1	0
1	1	1	0	0	0	0

$((x \wedge \bar{y}) \vee y)$	$\left(((x \wedge \bar{y}) \vee y) \wedge x\right)$	$(x \wedge y \wedge z)$	$(\bar{z} \wedge \bar{y})$	$(\bar{x} \wedge y)$
0	0	0	1	0
0	0	0	0	0
1	0	0	0	1
1	0	0	0	1
1	1	0	1	0
1	1	0	0	0
1	1	0	0	0
1	1	1	0	0

$\left((\bar{z} \wedge \bar{y}) \vee (\bar{x} \wedge y)\right)$	$(z \vee y)$	$\left(\left((\bar{z} \wedge \bar{y}) \vee (\bar{x} \wedge y)\right) \wedge (z \vee y)\right)$
1	0	0
0	1	0
1	1	1
1	1	1
1	0	0
0	1	0
0	1	0
0	1	0

$\Big(\big((x \wedge \bar{y}) \vee y\big) \wedge x\Big) \vee (x \wedge y \wedge z)$
0
0
0
0
1
1
1
1

$\Big(\big((x \wedge \bar{y}) \vee y\big) \wedge x\Big) \vee (x \wedge y \wedge z) \vee \Big(\big((\bar{z} \wedge \bar{y}) \vee (\bar{x} \wedge y)\big) \wedge (z \vee y)\Big)$
0
0
1
1
1
1
1
1

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X	Y	Z	$\bar{x}$	$\bar{y}$	$\bar{z}$	$(x \vee y)$	$(y \wedge (x \vee y))$	$(y \wedge (x \vee y) \wedge \bar{x})$	$(y \wedge z)$
0	0	0	1	1	1	0	0	0	0
0	0	1	1	1	0	0	0	0	0
0	1	0	1	0	1	1	1	1	0
0	1	1	1	0	0	1	1	1	1
1	0	0	0	1	1	1	0	0	0
1	0	1	0	1	0	1	0	0	0
1	1	0	0	0	1	1	1	0	0
1	1	1	0	0	0	1	1	0	1

$[(y \wedge (x \vee y) \wedge \bar{x}) \vee (y \wedge z)]$	$\{[(y \wedge (x \vee y) \wedge \bar{x}) \vee (y \wedge z)] \wedge x\}$
0	0
0	0
1	0
1	0
0	0
0	0
0	0
1	1

$(y \wedge \bar{z})$	$(\bar{x} \wedge \bar{z})$	$(y \wedge \bar{z}) \vee (\bar{x} \wedge \bar{z})$	$\{\bar{y} \wedge [(y \wedge \bar{z}) \vee (\bar{x} \wedge \bar{z})]\}$
0	1	1	1
0	0	0	0
1	1	1	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
1	0	1	0
0	0	0	0

$(x \wedge \bar{z})$	$[(x \wedge \bar{z}) \vee \bar{x}]$	$\{y \wedge z \wedge [(x \wedge \bar{z}) \vee \bar{x}]\}$	f(x,y,z)
0	1	0	1
0	1	0	0
0	1	0	0
0	1	1	1
0	1	0	0
1	1	0	0
0	0	0	0
1	1	0	0
0	0	0	1

Задание 3. Синтезируйте схему по известной функции проводимости:

1) $f(x_1, x_2, x_3) = (x_1 \vee x_2 \vee x_3) \wedge \bar{x}_1 = (x_2 \vee x_3) \wedge \bar{x}_1$

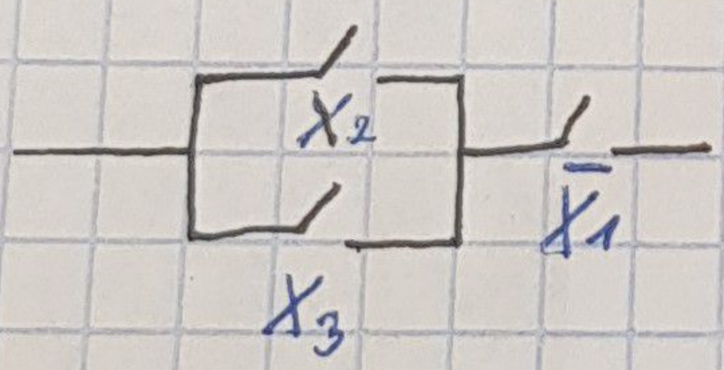
①

x_1	x_2	x_3	$(x_1 \vee x_2 \vee x_3)$	$\wedge \bar{x}_1$
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	1	1
1	0	0	1	0
1	0	1	1	0
1	1	0	1	0
1	1	1	1	0

②

$(x_2 \wedge x_3)$	$\vee$	$(\bar{x}_2 \wedge x_1)$	$\wedge \bar{x}_1$
0	0	0	0
0	0	0	0
0	0	0	0
1	1	0	1
0	1	1	0
0	1	1	0
0	0	0	0
1	1	0	0

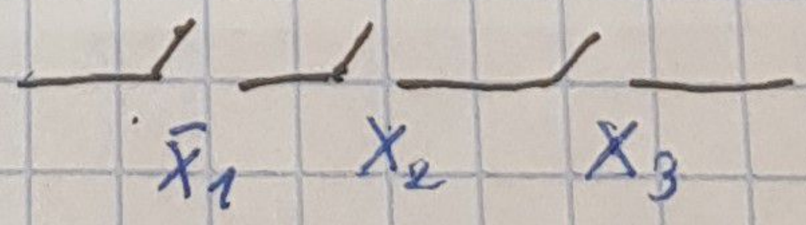
1)



2) $f(x_1, x_2, x_3) =$

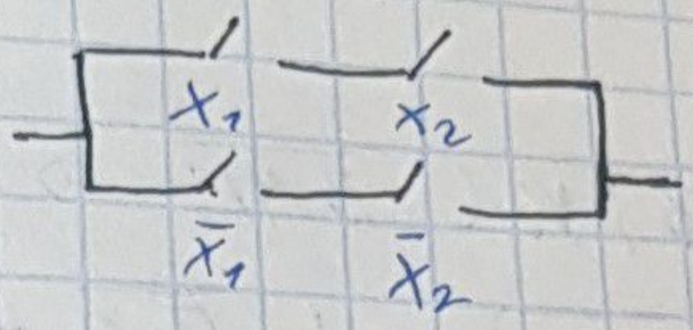
$= \bar{x}_1 \wedge ((x_2 \wedge x_3) \vee (\bar{x}_2 \wedge x_1)) =$

$= \bar{x}_1 \wedge x_2 \wedge x_3$



3) $f(x_1, x_2) = \bar{x}_1 \bar{x}_2 \vee x_1 x_2$

x_1	x_2	$f(x_1, x_2)$
0	0	1
0	1	0
1	0	0
1	1	1

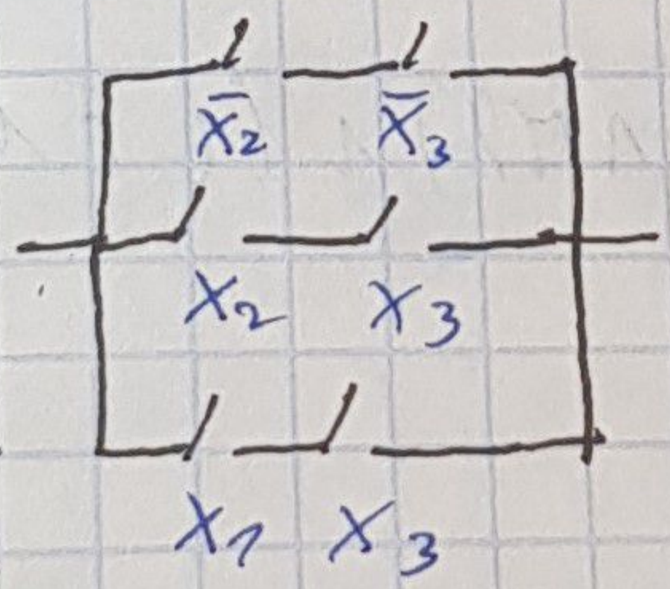


4) $f(x_1, x_2, x_3) =$ $\bar{x}_1 \bar{x}_2 \bar{x}_3 \vee \bar{x}_1 x_2 x_3 \vee x_1 \bar{x}_2 \bar{x}_3 \vee$

$\vee \; x_1 \bar{x}_2 x_3 \vee x_1 x_2 x_3 =$

$\bar{x}_2 \bar{x}_3 \vee x_2 x_3 \vee x_1 x_3$

x_1	x_2	x_3	f
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1



Задание 2.

A	→	C	B	→	C
0		0	1		0

Ответ: второй

Задание 5.

$$б = (\overline{АМ} \to \overline{СО}) \wedge (\overline{ВМП} \to АМ) \wedge (\overline{СП} \to ВК) \wedge$$

$$\wedge (\overline{ДМ} \to \overline{ВМ}) \wedge (\overline{ДО} \to \overline{ВМ}) =$$

$$= (АМ \vee \overline{СО}) \wedge (ВМП \vee АМ) \wedge (СП \vee ВК) \wedge$$

$$\wedge (ДМ \vee \overline{ВМ}) \wedge (ДО \vee \overline{ВМ}) =$$

~~$(АМ \cdot ВМП \vee АМ \cdot АМ \vee \overline{СО} \cdot ВМП \vee \overline{СО} \cdot АМ)$~~

$$= АМ \vee (\overline{СО} \wedge ВМП) \wedge (СП \vee ВК) \wedge \overline{ВМ} \vee (ДМ \wedge ДО) =$$

$$= (А \wedge М) \vee (\overline{С} \vee \overline{О} \wedge (В \wedge М \wedge П)) \wedge ((С \wedge П) \vee (В \wedge К)) \wedge$$

$$\wedge (\overline{В} \vee \overline{М}) \vee ((Д \wedge М) \wedge (Д \wedge О)) =$$

$$= (\overline{С} \vee \overline{О} \wedge (В \wedge М \wedge П)) \wedge ((С \wedge П) \vee (В \wedge К)) \wedge$$

$$\wedge (\overline{В} \wedge М)$$