

LABORATORIYA ISHI

AVTOMATIKADA QO'LLANUVCHI MANTIQUIY ELEMENTLARNI O'RGANISH VA MANTIQUIY FUNKSIYALARNI SINASH

Ishning maqsadi

1. *Mantiqiy* elementlarning tuzilishi, ishlash prinsipini va sharoitlarini o'rganish.
2. Asosiy *mantiqiy* funksiyalarni va ularni Festo Didaktik va T seriyali mantiqiy elementlarda ishlatish usulini o'rganish.
3. Haqiqiylik jadvali bo'yicha stendda mantiqiy funksiyalarni sinash.

Reja

- *Mantiqiy element (ME) ta'rifi*
- **Mantiq algebrasining asosiy tushunchalari**
- *Asosiy mantiqiy funksiyalar*
- **Mantiq algebrasining asosiy qonunlari**
- *Mantiqiy elementlarning parametrlari*

Umumiy tushunchalar

Xalq xo'jaligining xamma tarmoqlarida mehnat unumdorligi bilan mos ravishda avtomatlashtirish darajasining o'sishi elektr qurilmalari sxemalarining murakkablashuviga olib keladi. Bu sxemalardagi asosiy qurilma rele xisoblanadi. U qoidaga binoan, elektr signallarning ko'payishi, kuchayishi va bloklash uchun xizmat qiladi. Relelar ishining ishonchligi esa yuqori emas. Relening qo'zgaluvchan elementlari yeyiladi, tebranishdan vintli birikmalarning mexanik mustaxkamligi buziladi, kontaktlar kuyadi va hokazo. Shuningdek tashqi omillar, ya'ni xaroratning ko'tarilishi, chang, agressiv mushit ta'siri, metall narsalarning oksidlanishiga, elektr ulanishining buzilishiga olib keladi. Bundan tashqari rele juda xajmdor qurilma. U ishlayotganda shovqin va tebranishlar tarqatadi. Ular katta ogirlikka va inertsionlikka ega. Zamonaviy elektronikada rele qurilmalari o'rniga, ularning vazifasini to'la bajara oladigan kontaktsiz elementlar qo'llaniladi. Rele va kontaktsiz sxemalarda signalning o'tishi maxsus matematik apparat yordamida yoziladi.

Mantiq algebrasining asosiy tushunchalari

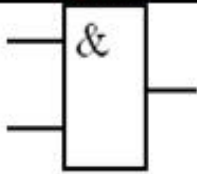
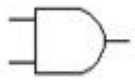
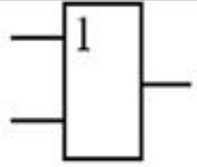

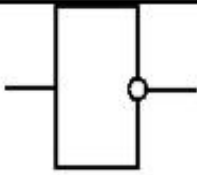
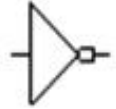
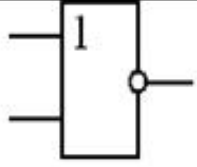

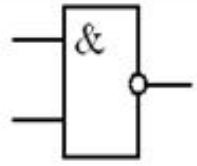
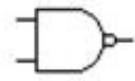
Mantiq algebrasi -bu 0 va 1 qiymatlarini qabul qilib, o'zgaruvchan kattaliklar o'rtasidagi bogliqlikni o'rganadigan analiz va sintez matematik apparatidir. Bu ikkita qiymatga qarshi o'zaro qarama-qarshi hodisalar, shart va xolatlar qo'yiladi. Masalan, kontaktning ulanishi-1, kontaktning ajralishi-0: signal mavjudligi-1, signalning yoqligi-0: yopiq zanjir-1, ochiq zanjir-0.

Bu yerda shuni nazarda tutish kerakli, 0 va 1 raqamlari miqdoriy nisbatni anglatmaydi va son xam emas, balki ular simvol xisoblanadi.

Mantiqiy o'zgaruvchi deb - faqat ikkita 0 va 1 qiymatlarini qabul qiluvchi kattalikka aytiladi.

Mantiqiy funksiya deb -argumentlari kabi faqat 0 va 1 qiymatlarni qabul qiluvchi funksiyaga aytiladi. *Mantiqiy* funksiyalarda kirishdagi va o'zgaruvchi qiymatlarning turli xil amallari termalar deyiladi. Kirishdagi o'zgaruvchilar qiymatlari va mantiqiy funksiyalar qiymatlari termasi funksiyaning xaqiqiylik jadvali deyiladi. Jadvaldan foydalanishning afzalligi shundaki, funksiyaning matematik yozuvi, uning tarkibini hamma vaqt xam yaqqol ko'rsatavermaydi. Bu bo'lim bo'yicha qo'shimcha adabiyot "Xisoblash texnikasi" kursida tavsiya qilinadi.

Asosiy mantiqiy funksiyalar

<u>Мантиқий функция</u>	<u>Структура формуласи</u>	<u>Шартли белгиси</u>	<u>EW даги белгиси</u>	<u>Ҳақиқийлик жадвали</u>															
«ВА» <u>мантиқий кўпайтирув</u>	$F = x_1 \cdot x_2$			<table border="1"> <tr><td>x_1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr> <tr><td>x_2</td><td>0</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>F</td><td>0</td><td>0</td><td>0</td><td>1</td></tr> </table>	x_1	0	0	1	1	x_2	0	1	0	1	F	0	0	0	1
x_1	0	0	1	1															
x_2	0	1	0	1															
F	0	0	0	1															
«ЁКИ» <u>мантиқий қўшув</u>	$F = x_1 + x_2$			<table border="1"> <tr><td>x_1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr> <tr><td>x_2</td><td>0</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>F</td><td>0</td><td>1</td><td>1</td><td>1</td></tr> </table>	x_1	0	0	1	1	x_2	0	1	0	1	F	0	1	1	1
x_1	0	0	1	1															
x_2	0	1	0	1															
F	0	1	1	1															
«ЭМАС» <u>мантиқий инкор</u>	$F = \bar{x}$			<table border="1"> <tr><td>x</td><td>0</td><td>1</td></tr> <tr><td>F</td><td>1</td><td>0</td></tr> </table>	x	0	1	F	1	0									
x	0	1																	
F	1	0																	
«ЁКИ-ЭМАС»	$F = \overline{x_1 + x_2}$			<table border="1"> <tr><td>x_1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr> <tr><td>x_2</td><td>0</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>F</td><td>1</td><td>0</td><td>0</td><td>0</td></tr> </table>	x_1	0	0	1	1	x_2	0	1	0	1	F	1	0	0	0
x_1	0	0	1	1															
x_2	0	1	0	1															
F	1	0	0	0															
«ВА-ЭМАС»	$F = \overline{x_1 \cdot x_2}$			<table border="1"> <tr><td>x_1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr> <tr><td>x_2</td><td>0</td><td>1</td><td>0</td><td>1</td></tr> <tr><td>F</td><td>1</td><td>1</td><td>1</td><td>0</td></tr> </table>	x_1	0	0	1	1	x_2	0	1	0	1	F	1	1	1	0
x_1	0	0	1	1															
x_2	0	1	0	1															
F	1	1	1	0															

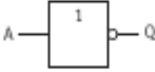
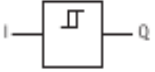


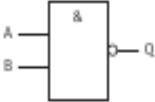
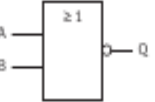
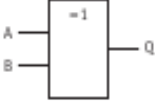

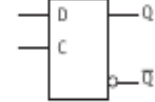

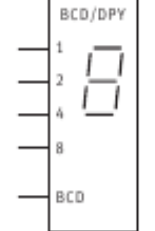
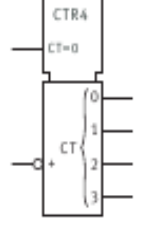
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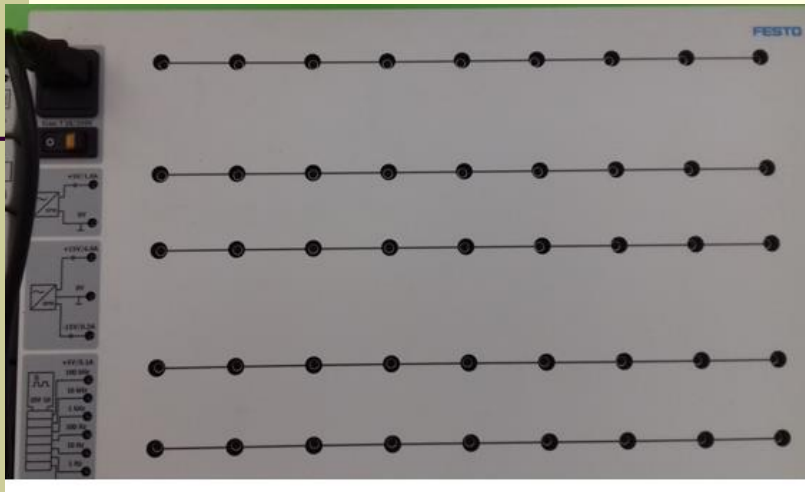
Ishning maqsadi

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Festo Didaktik Stendning komplekti (shartli belgilanishi)

Nomi	Grafik belgilanishi	Nomi	Grafik belgilanishi
Invertor		Shmitt triggeri	
VA funksiyasi		YOKI funksiyasi	
VA-EMAS funksiyasi		YOKI-EMAS funksiyasi	
YOKI funksiyasi		RS zanjirli trigger	
D flip-flop		JK zanjirli trigger	
Impulslar schyotchigi		Schyotchik	

Mantiqiyi element laboratoriya stendining ko`rinishi



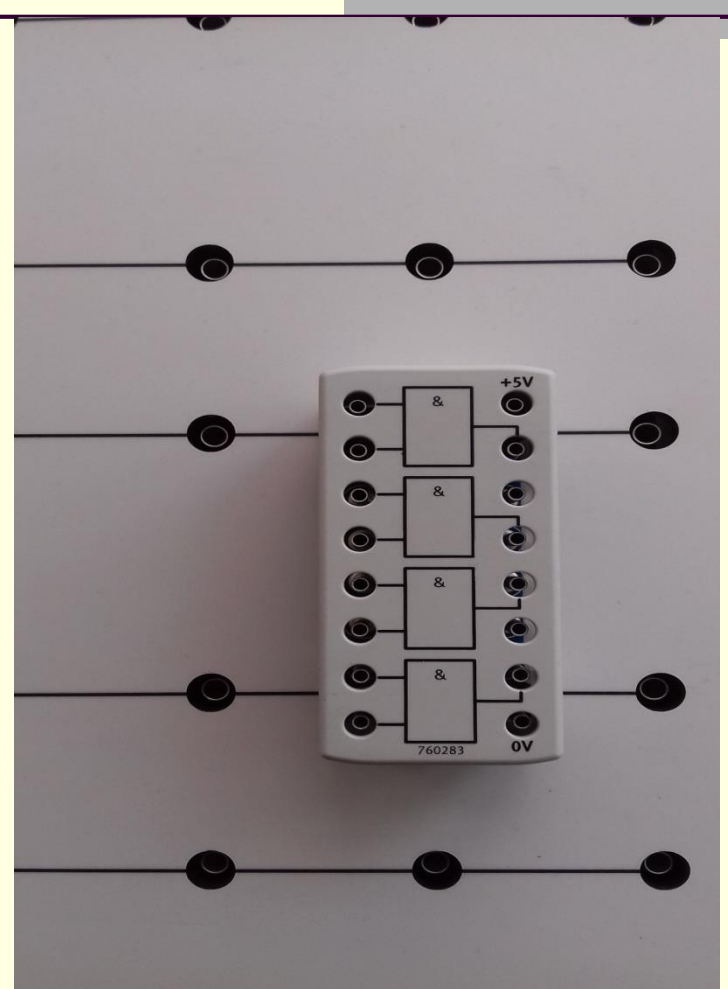
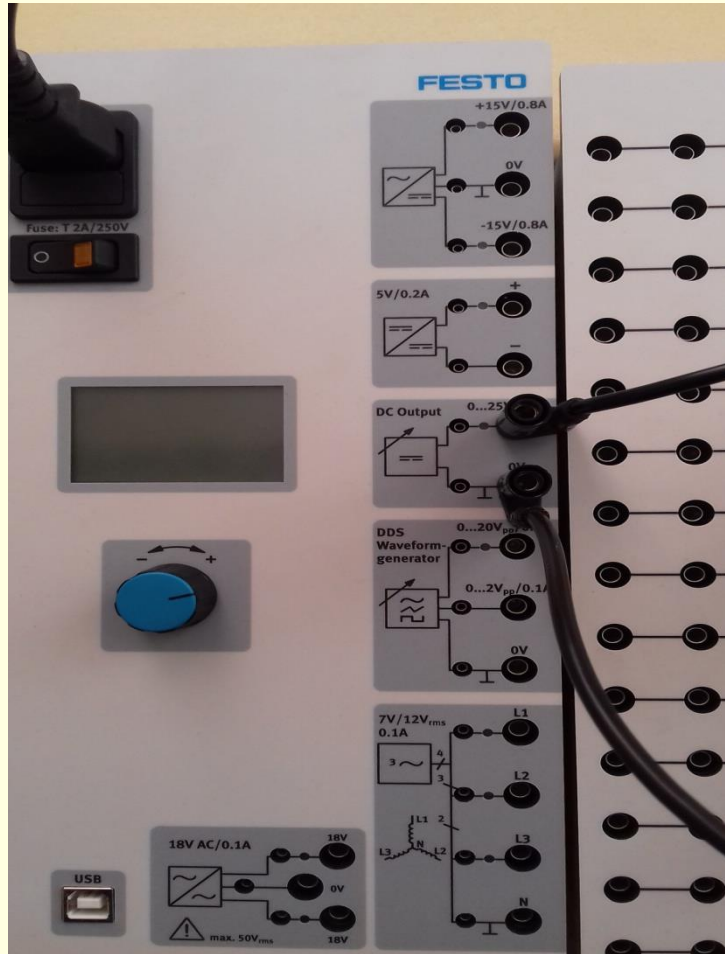
Yig`ish paneli

Mantiqiyi elementlar komplekti

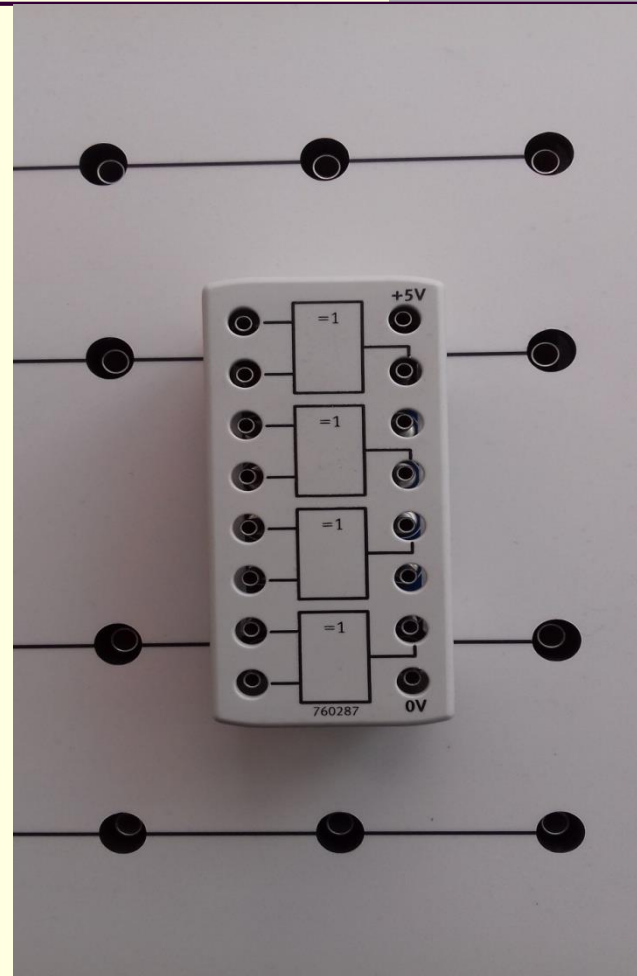
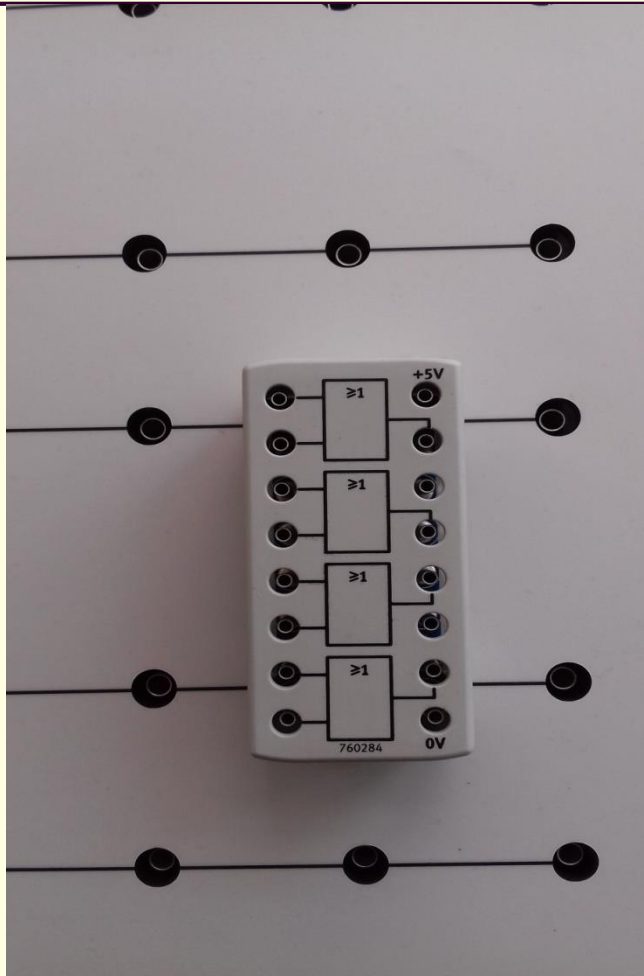


Yig'ish panelidagi tarmoqqa ulash.

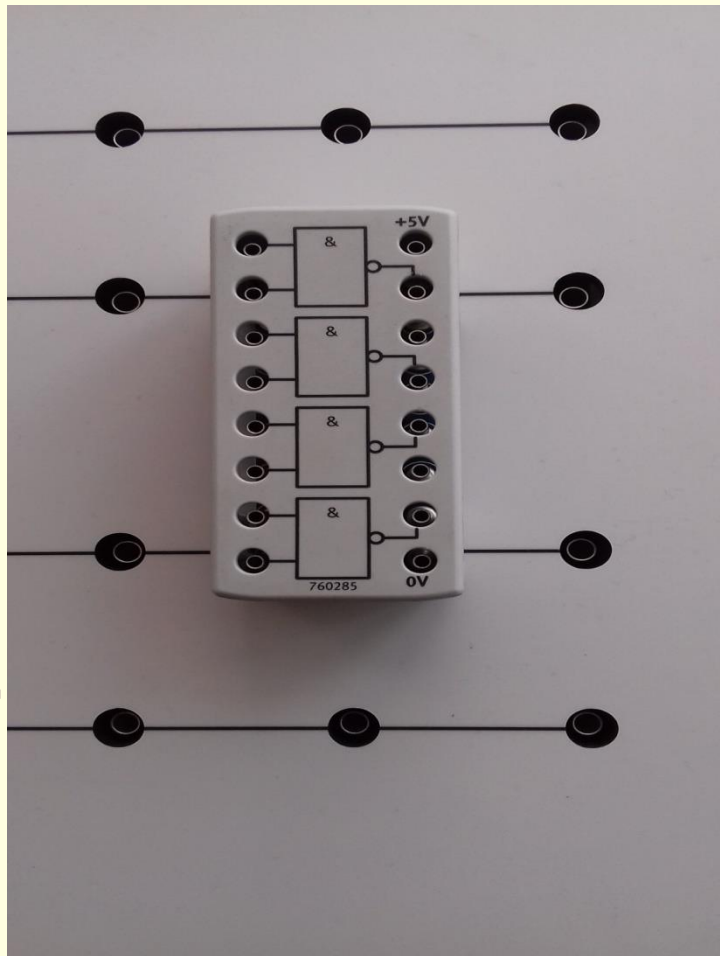
VA funksiya



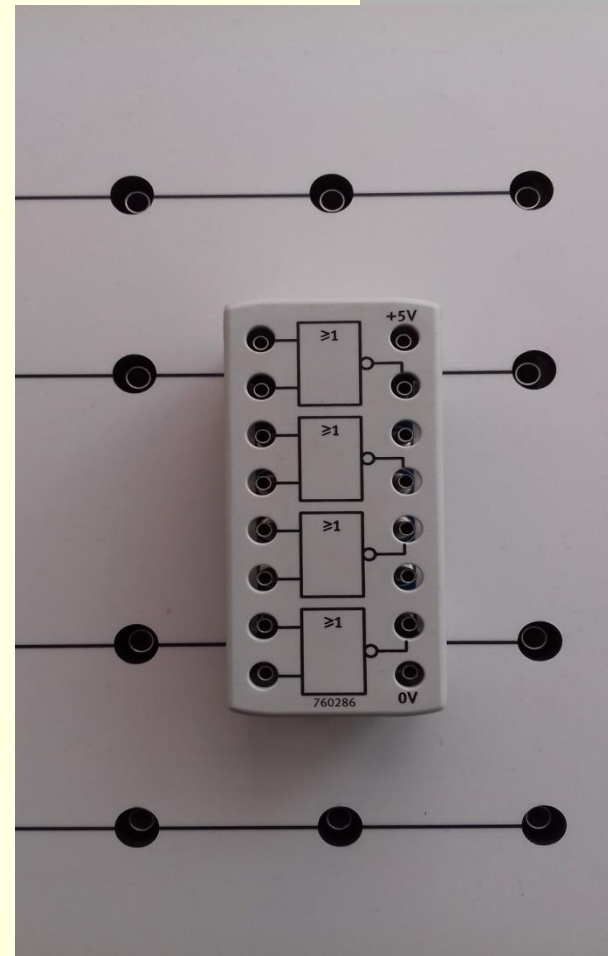
YOKI funksiya



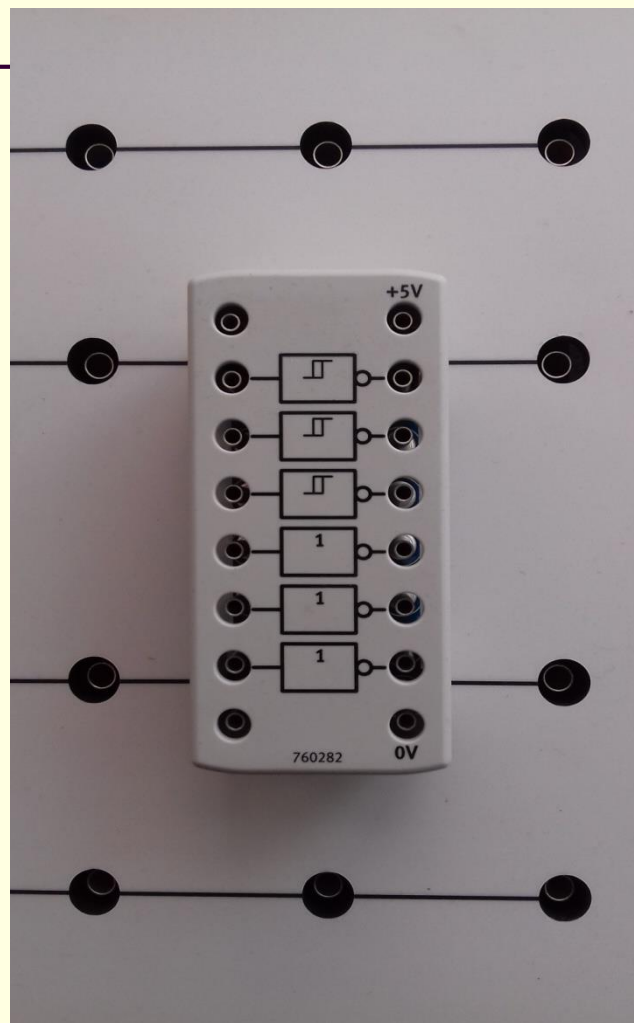
VA-EMAS funksiya



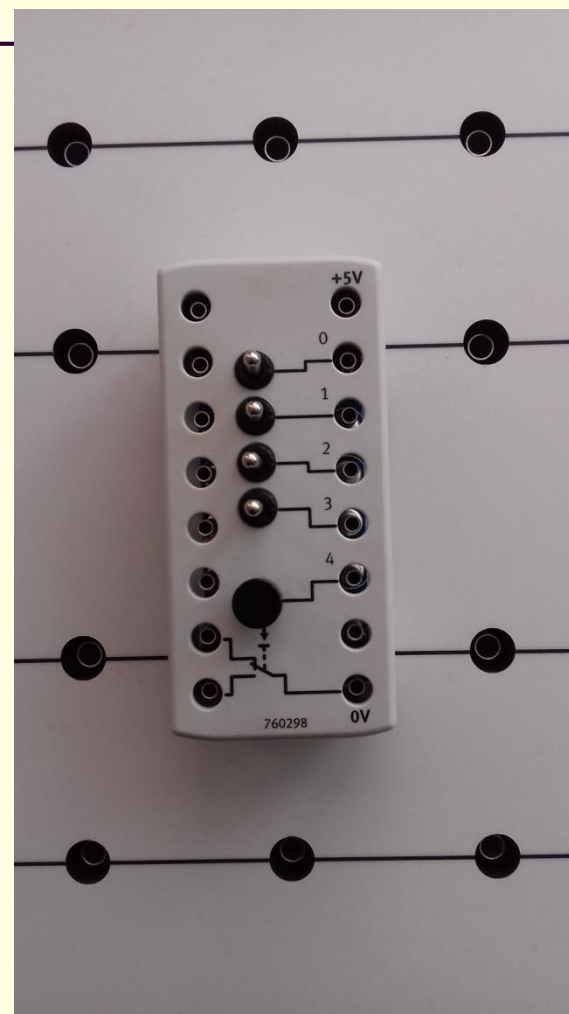
YOKI-EMAS funksiya



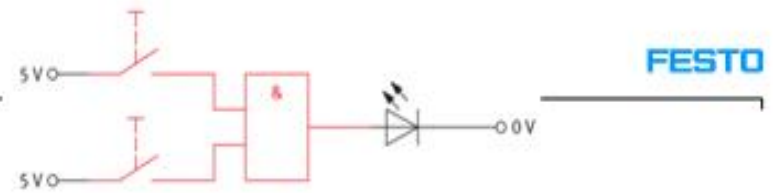
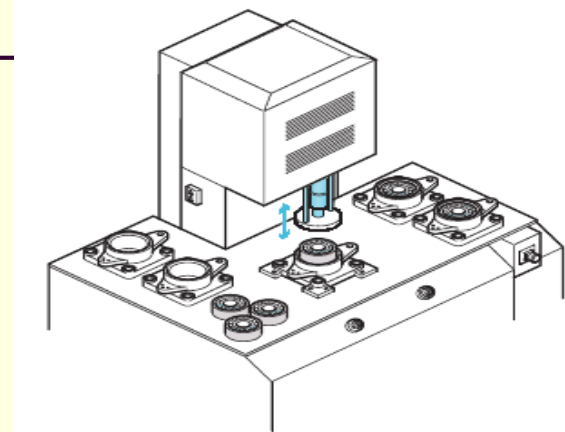
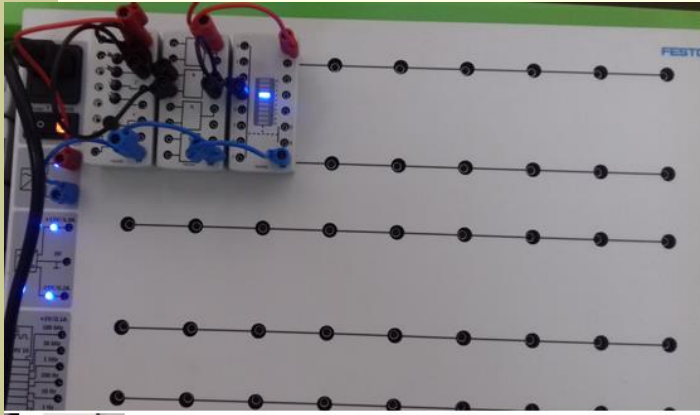
Shmitt triggeri va Invertor (EMAS) funksiya



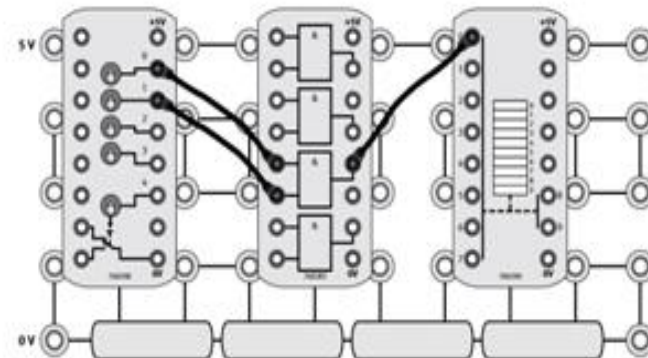
Stenddagi elementlarni ulash kaliti



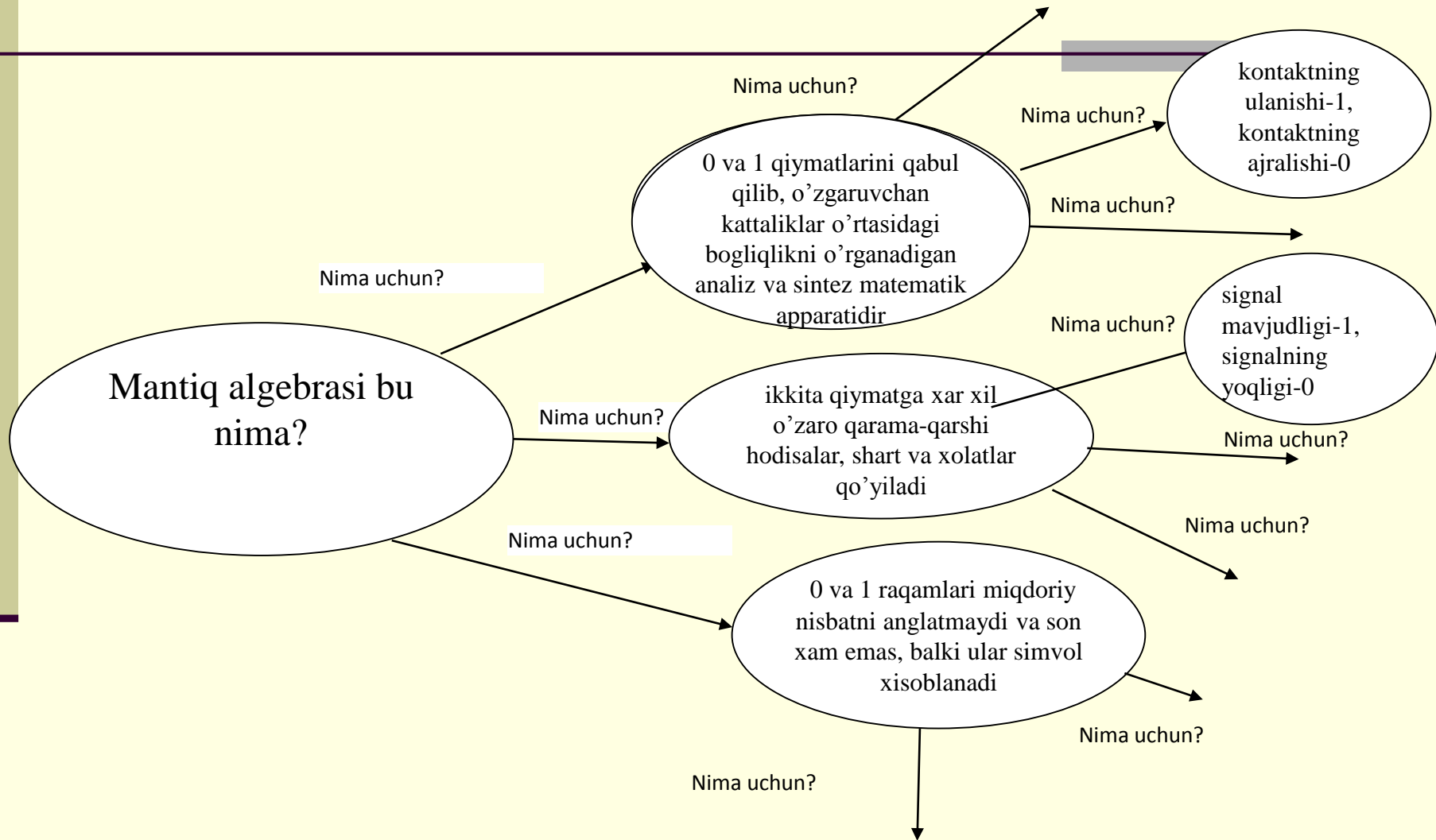
VA mantiqiy funksiyasi



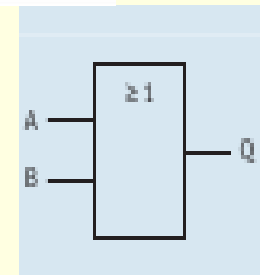
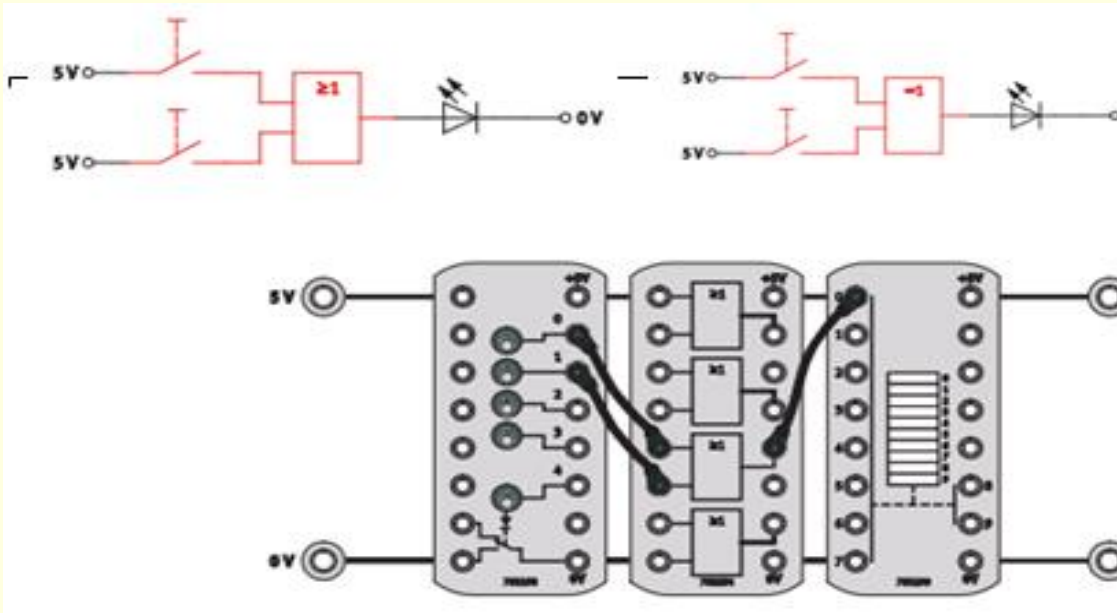
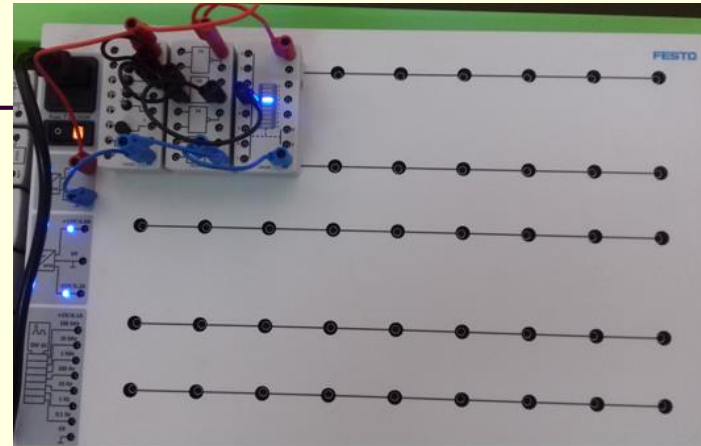
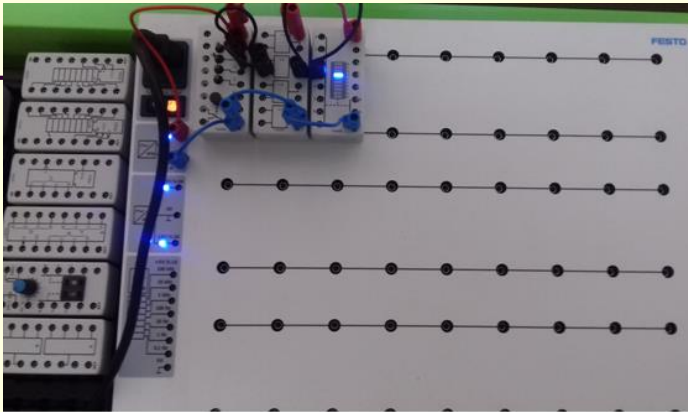
A	B	Q
0	0	0
0	1	0
1	0	0
1	1	1



«Nima uchun?» sxemasi «Mantiqiy algebrasidan foydalanish masalasi»

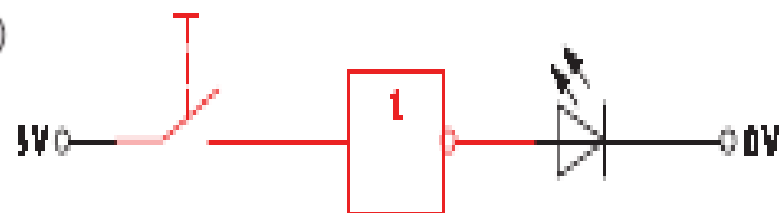
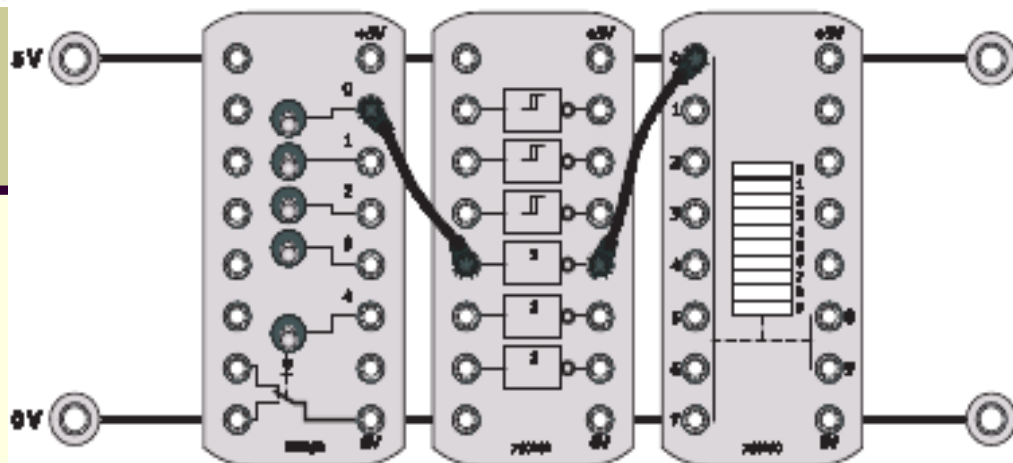
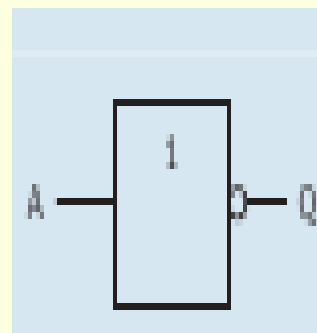
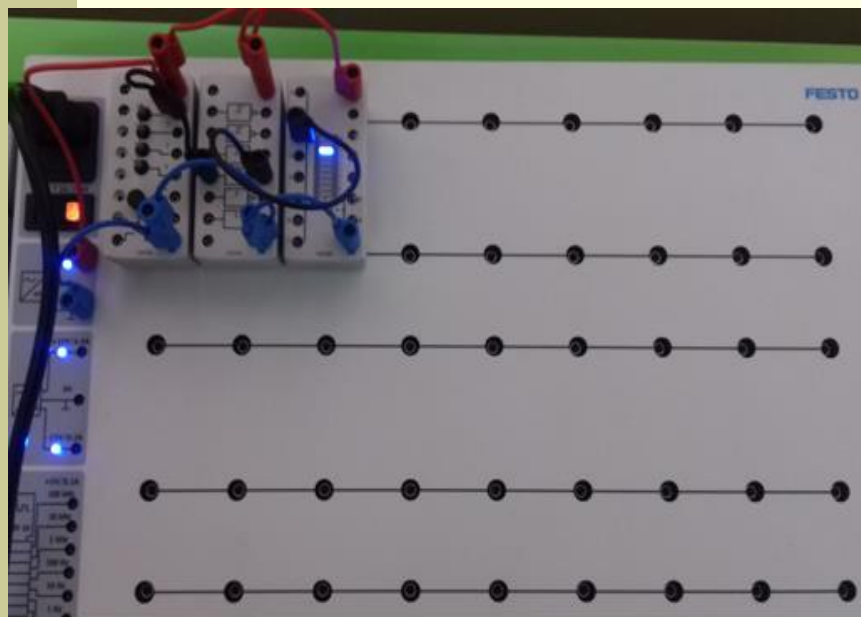


YOKI mantiqiy funksiyasi

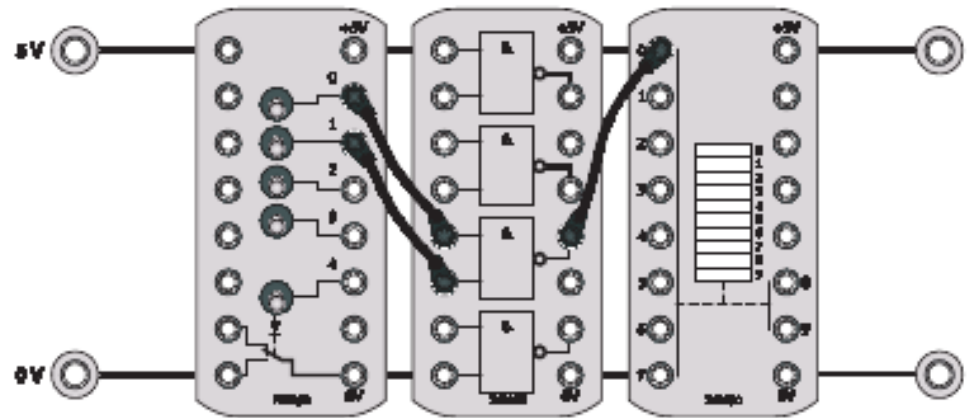
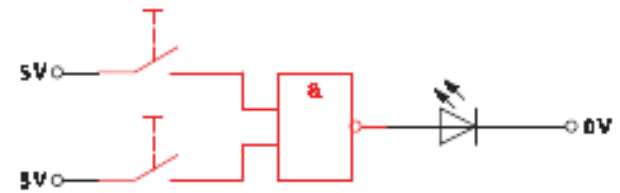
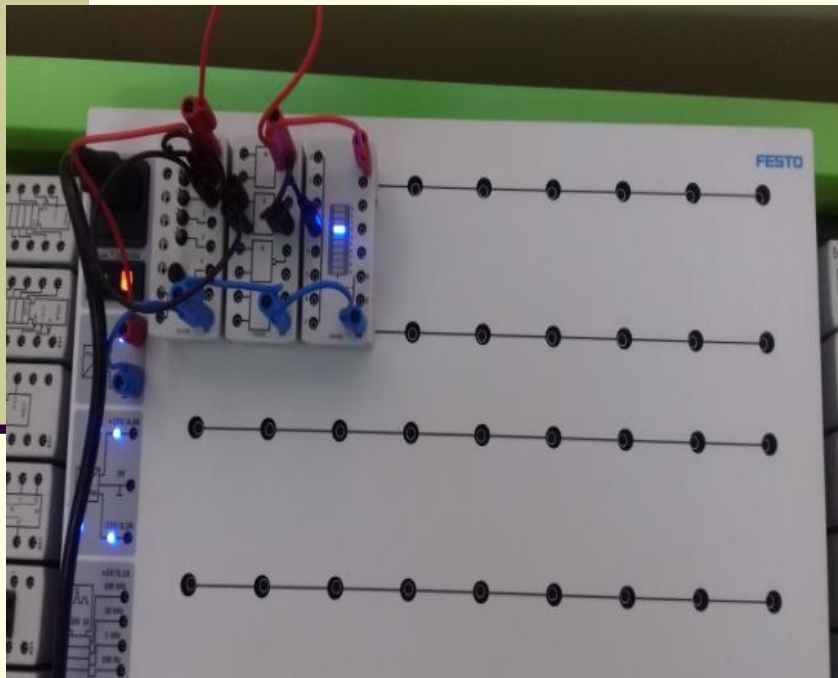
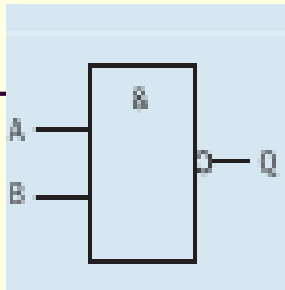


A	B	Q
0	0	1
0	1	1
1	0	1
1	1	0

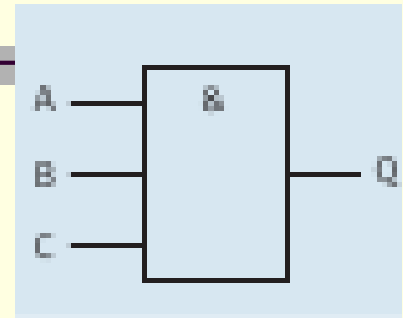
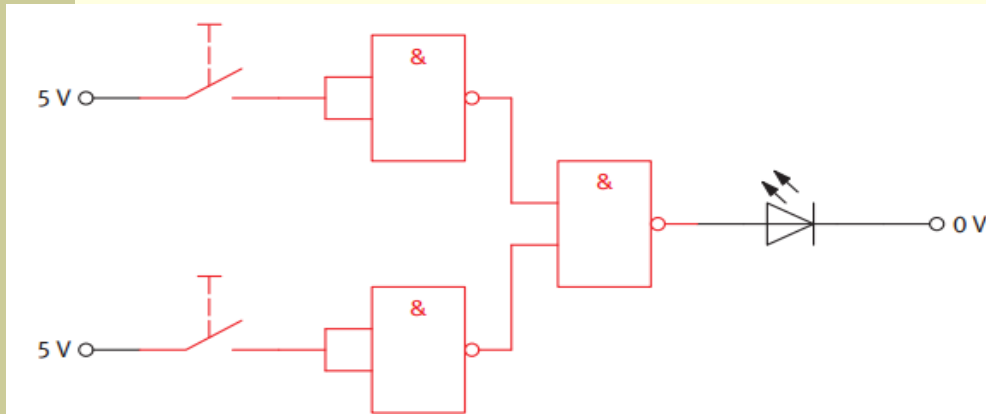
EMAS mantiqiy funksiyasi



“VA-EMAS” funksijsi



YOKI-EMAS funksiyesi

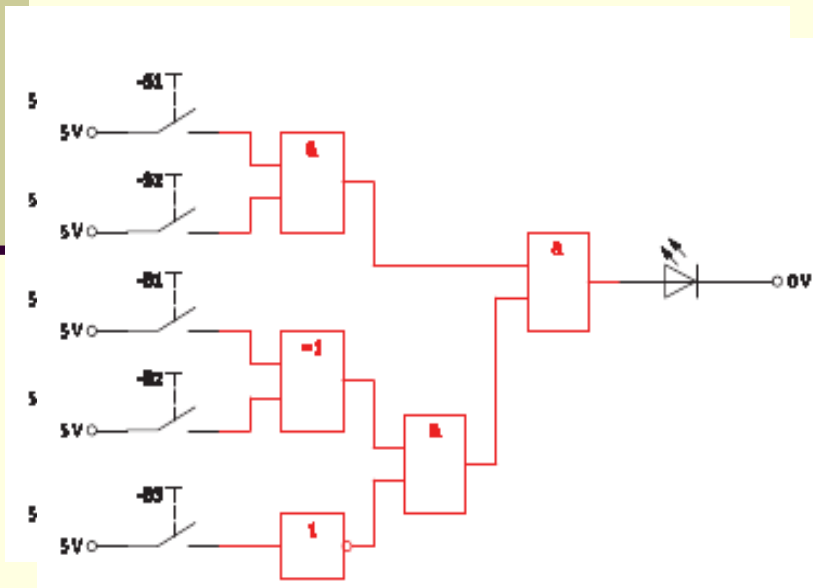


$$Q_1 = A \vee B \vee C,$$

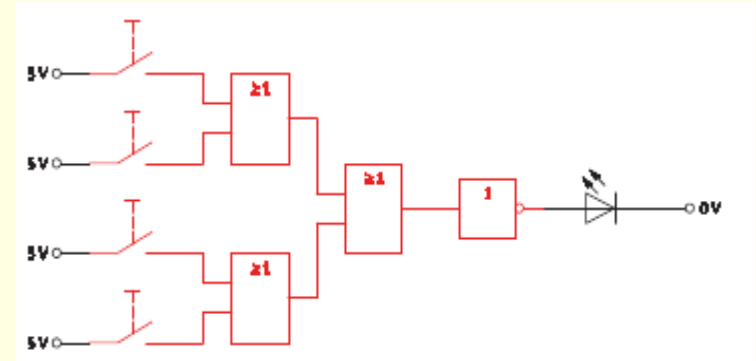
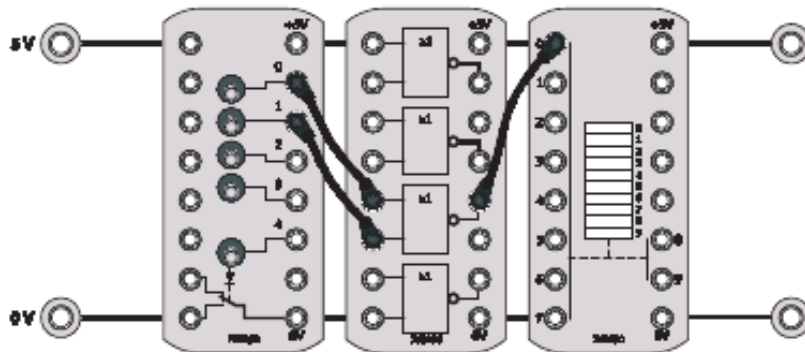
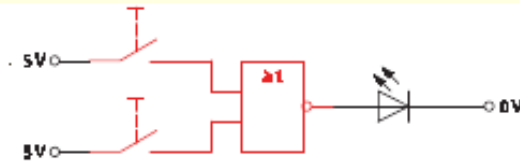
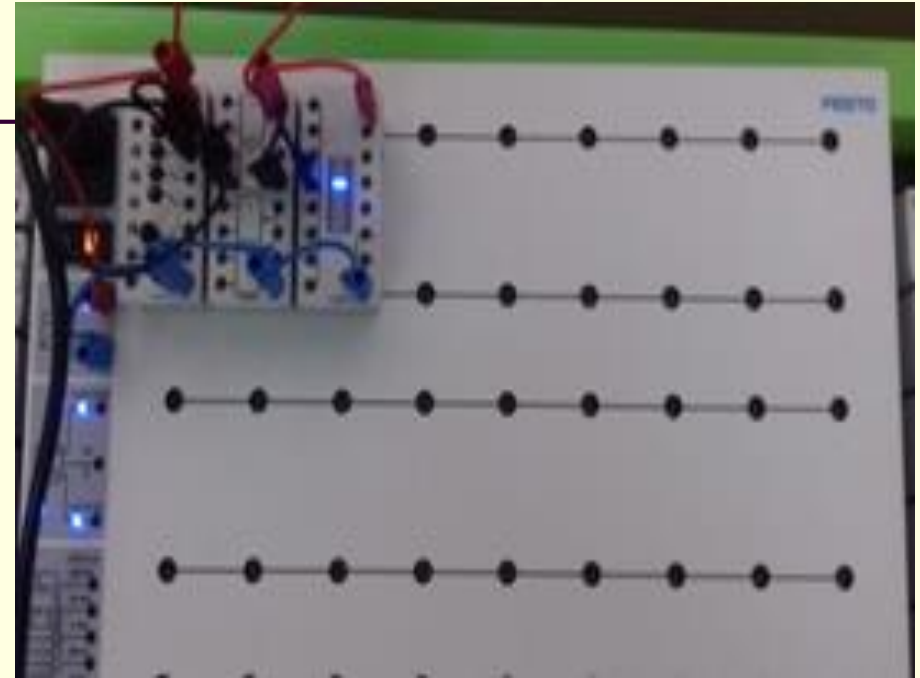
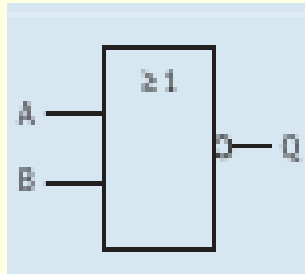
$$Q_2 = A \wedge B \wedge \overline{C} \text{ and}$$

$$Q_3 = A \oplus B \oplus C.$$

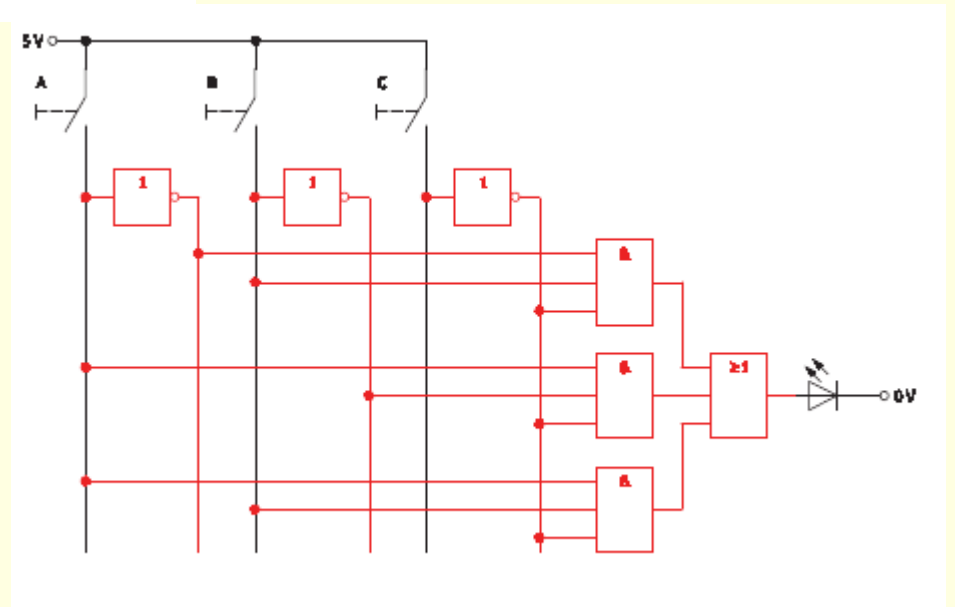
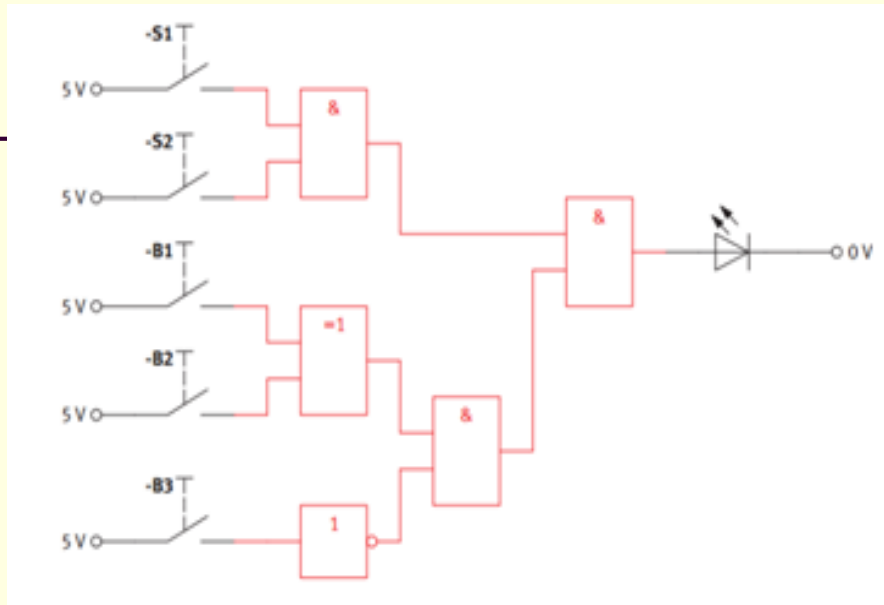
A	B	C	Q ₁	Q ₂	Q ₃
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0	1	0	1	1	1
0	1	1	1	1	0
1	0	0	1	1	1
1	0	1	1	1	0
1	1	0	1	1	0
1	1	1	1	0	0



“YOKI-EMAS” funksiyasi



Mantiqiy elementlarni qo`llash misollari



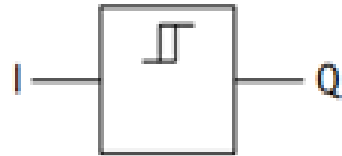
Bul algebrasi asoslari

- The NOT operation \bar{A}
- The AND operation $A \wedge B$
- The OR operation: $A \vee B$

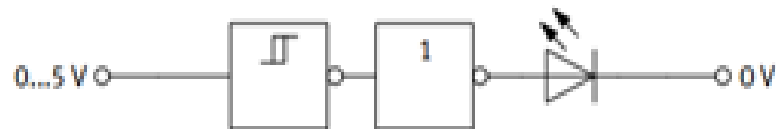
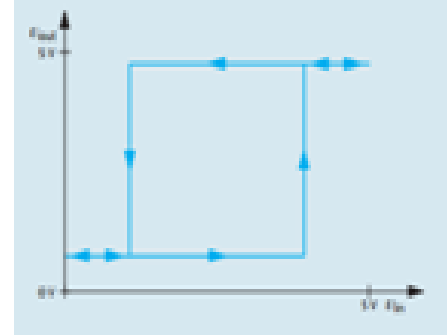
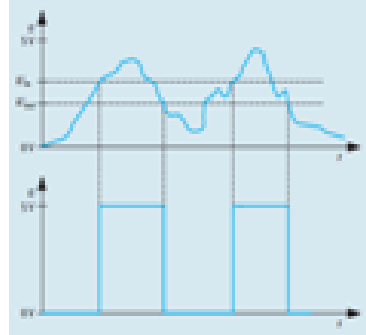
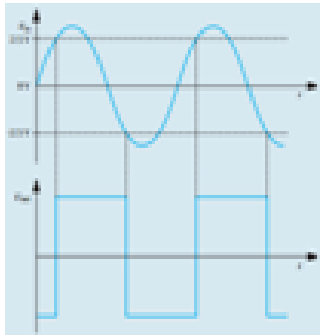
Bitta yo ikkita o'zgaruvchan operatsiyalarni ko'rishdagi mantiqiy qonunlar

- $\overline{\bar{A}} = A$ The double negation of a variable returns us again to its actual value.
- $\bar{1} = 0$ The negation of 1 results in 0.
- $\bar{0} = 1$ The negation of 0 results in 1.
- $A \vee 1 = 1$ Disjunction with 1 always results in 1.
- $A \wedge 0 = 0$ Conjunction with 0 always results in 0.
- $A \vee 0 = A$ Disjunction with 0 results in A (0 is the neutral element of disjunction).
- $A \wedge 1 = A$ Conjunction with 1 always results in A (1 is the neutral element of conjunction).
- $A \vee A = A$ Disjunction of A with A results in A.
- $A \wedge A = A$ Conjunction of A with A results in A.
- $A \vee \bar{A} = 1$ Disjunction of A with the negation of A always results in 1.
- $A \wedge \bar{A} = 0$ Conjunction of A with the negation of A always results in 0.

Shmitt triggeri



FESTO



LABORATORIYA ISHI

AVTOMATIKADA QO'LLANUVCHI MANTIQUIY ELEMENTLARNI O'RGANISH VA MANTIQUIY FUNKSIYALARNI SINASH

Ishning maqsadi

1. *Mantiqiy* elementlarning tuzilishi, ishlash prinsipini va sharoitlarini o'rganish.
2. Asosiy *mantiqiy* funksiyalarni va ularni T seriyali mantiqiy elementlarda ishlatish usulini o'rganish.
3. Haqiqiylik jadvali bo'yicha stendda mantiqiy funksiyalarni sinash.

Laboratoriya qurilmasining tavsifi

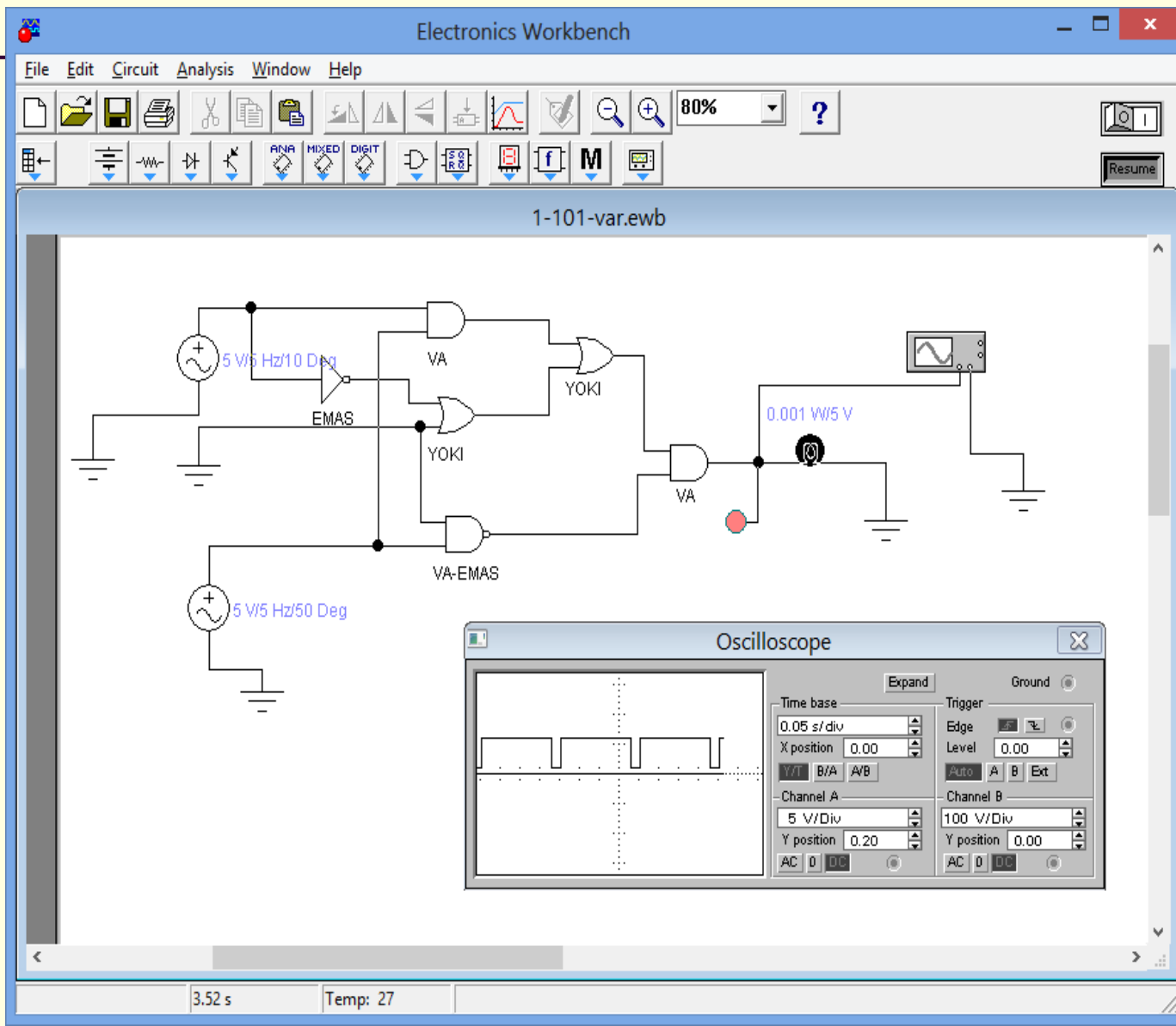
stendda mantiqiy elementlar o'rnatilgan. Ular yordamida 10 ta mantiqiy funksiya (yoki, va, emas, yoki emas, va-emas, man qilmoq, implikasiya, xotira, ushlanib qolish, takrorlash) ni bajarish mumkin.

Mantiqiy elementlarga "TARMOQ" tumblyeri ulanishi bilan elektr energiyasi uziladi. Paneldagi V_1 va V_2 kalitlari yordamida 0 va 1 kirish signallari uzatiladi. Signallar tumblerdan mos ravishda 1 va 2 klemmalariga uzatilaadi. Bu klemmalar esa sxemaga ulanadi. Mantiqiy elementlarining kirish joyi stenddagi prinsipial sxemaga binoan, klemmalarga chiqarilgan.

Ishni bajarilish tartibi

1. Laboratoriya stendi bilan tanishib chiqing va undagi elementlarning vazifasini farqlab oling.
2. "Tarmoq" tumblerini o'chirilgan xolatga o'tkazing.
3. Stendni tarmoqqa ulang.
4. O'qituvchining topshirigiga binoan, u topshirgan mantiqiy funksiyani yiging va V_1 va V_2 tumblyerlari orqali kirish signallarini uzatish yo'li bilan uni sinang.
5. Stendni o'chiring, sxemani yigishtiring, ish joyini tartibga keltiring.

Electronics Workbench dasturida bajarilgan Mantiqiy funksiya



“Nilufar guli” sxemasi- Muammoni hal qilish uchun choralarni ishlab chiqish

<p>"VA" funksiyasi mant. qo'paytiruv, yoki kon'yuksiya $y=x_1*x_2$</p>	<p>"YOKI" funksiyasi mantiqiy qo'shuv, yoki dez'yunksiya, $y=x_1+x_2$</p>	<p>"EMAS" funlsiyasi mantiqiy inkor, $y=x$</p>
<p>"TAKRORLOVChI" funksiya, matematik ko'rinishi, $y=k*x$</p>	<p>Mantiqiy elementlar-ning asosiy funksiyasi</p>	<p>"VA-EMAS" funksiyasi Sheffer shtrixi yoki operas. $y=x_1*x_2$</p>
<p>"IMPLIKASIYA" funksiyasi, y chiqish signali, kirishda x_2 yoq x_1 bor bo'lsa, mavjud</p>	<p>"UShLAB TURISH" funksiyasi $y=(t-r)$</p>	<p>"YOKI-EMAS" funksiyasi Pirs strelkasi, yoki jarayon $y=x_1+x_2$</p>

“LOGIKA-1” mantiqiy elementlari

T seriyasi 19 ta elementdan iborat bo'lib, 4 ta guruhga bo'lingan: 7 ta mantiqiy element, 3 ta funksional element, 4 ta vaqt elementi, 5 ta kirish kuchaytirgichlari.

Umumiy texnik ko'rsatkichlar. 40 ming soatlik xizmat muddati, nuqsonsiz ishlash ehtimolligi $r = 0,9$ li ulanishlar soniga bogliq emas.

Elementlar quydagi shartlarda normal ishni ta'minlaydi:

- iste'moldagi kuchlanish xatoligi nominal qiymatdan 10-15% bo'lganda:
- tashqi mushit xarorati -40° dan $+50^{\circ}$ S gacha bo'lganda:
- atrof muxitning nisbiy namligi 90% gacha va xarorati 25° S bo'lganda:
- 4d gacha tezlanish chastotasi 5-200 Gs diapazonadagi tebranishlar.

Tranzistorli elementlar ishi ishonchli, sozlanishga va tayyorlanayotganida, ishlayotganida rostlanishga mushtoj emas, kuzatib turishni talab qilmaydi, atrof muxitning no'maqul sharoitida xam ishlay oladi.

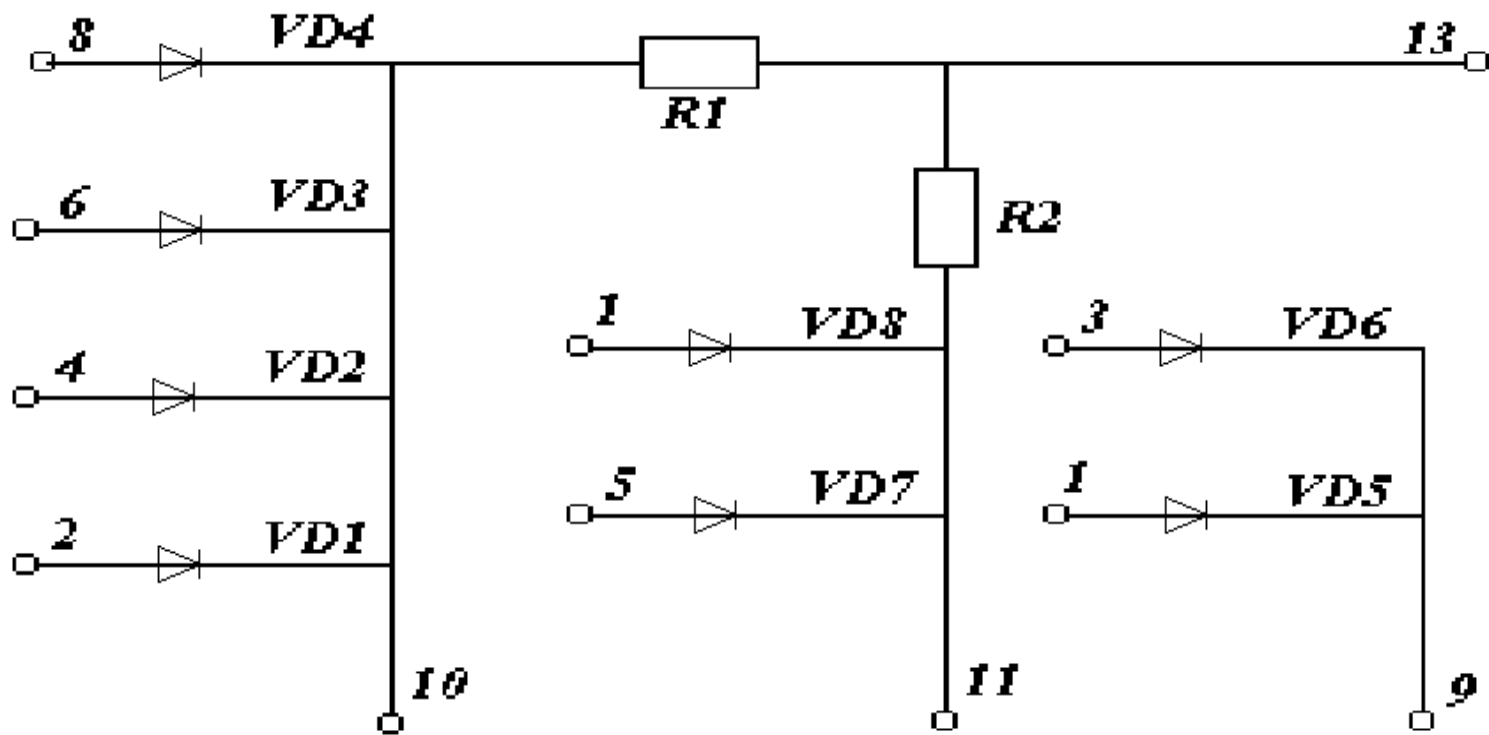
Ko'pchilik elementlar diskretli signallardan oladigan ikkita darajadagi kuchlanishlarda ishlash uchun xizmat qiladi (shartli "0" bilan belgilangan kichik daraja "1" bilan belgilangan katta daraja). "0" signali o'zgarmas tokda 1 voltdan oshmasligi, "1" signali o'zgarmas tokda 4 voltdan kam bo'lmasligi zarur. Signallarning qutbiyligi manfiy. T seriyali elementlar kontaktsiz va kontaktli datchiklar bilan ishlashi mumkin. Elementlarning iste'mollaydigan kuchlanishi - minus 12 va 24 volt. Siljish kuchlanishi - plus 6V. Kirish signali "1" -4...12 V, kirish signali "0" -0..1 V.

Elementlar konstruksiyasi.

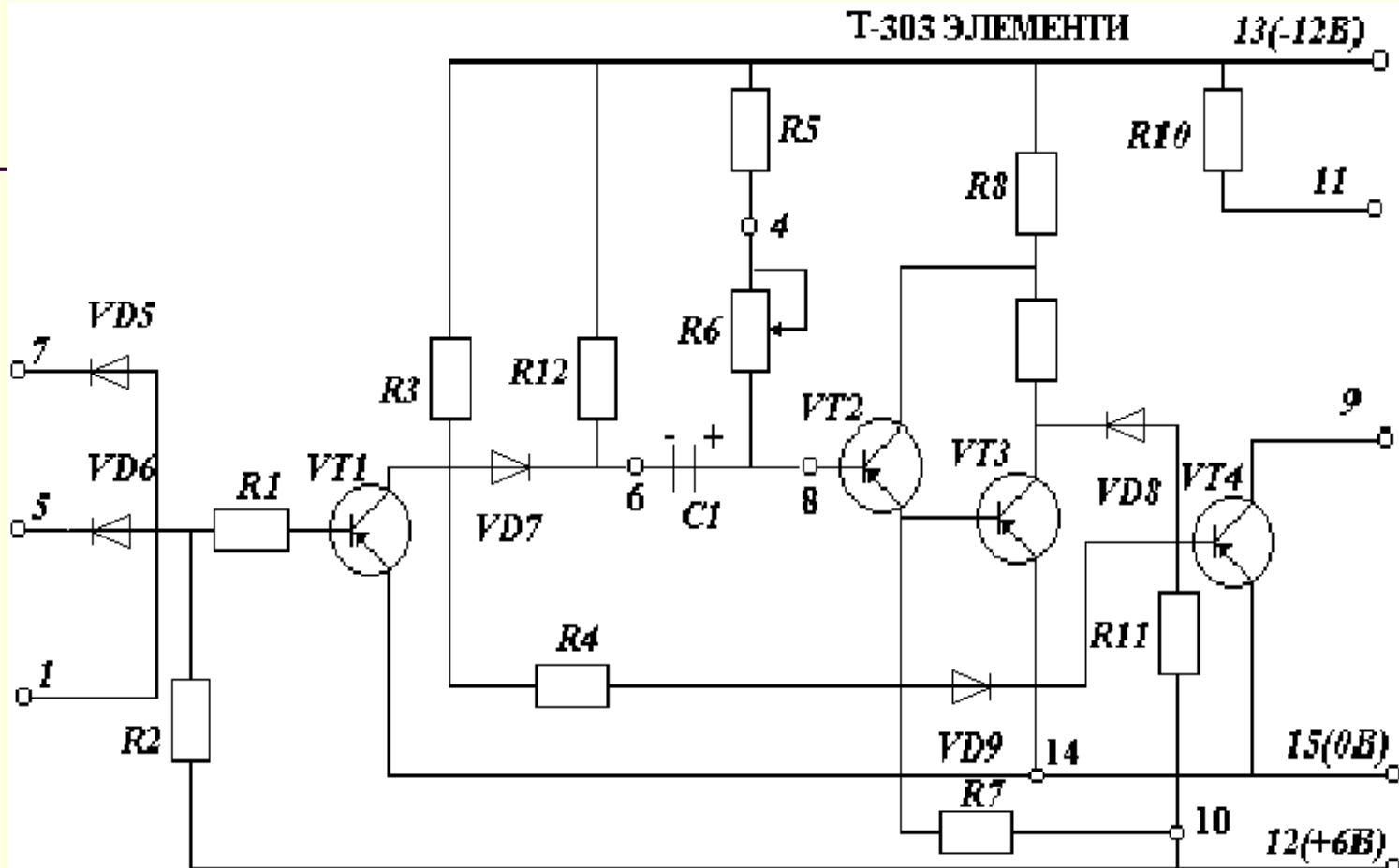
Elementlar quyidagicha modul ko'rinishida tuzilgan: yarimo'tkazgich, rezistorlar va boshqa detallar pechat montajli getinaksdan qilingan plataga o'rnatilgan. Ular polistirol qutichaga joylashtirilib, epoksid asosli kompaund bilan quyilgan. Konstrukciyalarni bo'laklarga bo'lib va remont qilib bo'lmaydi.

T-107 seriyali mantiqiy elementning ishlash prinsipi

■ T-107 elementi “VA” funkssiyani bajarish uchun xizmat qiladi. Tashqi kommutatsiyasiz T-107 elementi ikkita “VA” sxemasini bajaradi: bitta 10 chiqishi bilan 4ta kirishga (2, 4, 6, 8 chiqishlari), ikkinchisi 11dagi chiqish bilan 2ta kirishga (5, 7 chiqishlari). V5 va V6 diodlirining tashqi kommutatsiya yordamida 4ta kirish bilan ikkita “VA” sxemasi yoki 6ta kirish bilan bitta “VA” sxemasi va 2ta kirish bilan “VA” sxemasini bajarish mumkin. 9 va 13 chiziqlari o’rtasiga ulangan tashqi rezistor yordamida 4ta kirish bilan bitta “VA” sxemasiga, 2ta kirish bilan ikkita “VA” sxemasini bajarish mumkin



1- rasm. T-107 seriyali mantiqiy element.



2-rasm. T-303 seriyali mantiqiy element

Keys-stadi metodida qo'llaniladigan tahlil (analiz) turlari

Tahliliy faoliyat turlari	Tavsifi	Namoyon bo'lish shakli
Avtomatik boshqarish tizimlarida avtomatik texnik vositalarini qo'llanilishi	Avtomatik boshqarish tizimlarida avtomatik texnik vositalari ishini tekshirish	<ol style="list-style-type: none"> 1) Signallarni o'zgartirish 2) Avtomatik ravishda qo'shish va o'chirish 3) Signal kuchaytirish
Avtomatik texnik vositalarini prinsipial elektr sxemada belgilanishi	Avtomatik texnik vositalarini ishlash prinsipini o'rganish	<ol style="list-style-type: none"> 1. Elektromagnit relening kontaktlarining ishdan chiqishi; 2. Avtomatik vositalarining qizishi va buzilish holati; 3. Avtomatik texnik vositalar tarkibidagi yarim o'tkazuvchi elementlarning ishdan chiqishi.
Avtomatik texnik vositalarini mantiqiy elementning funksiyalari va qo'llanilishi;	Avtomatik boshqarish tizimida mantiqiy elementlarni tekshirish	<ol style="list-style-type: none"> 1) Mantiqiy elementlarni noto'g'ri tanlash; 2) Mantiqiy elementlar funksiyalarining mos kelmasligi
Mantiqiy elementlarda qo'llanilgan yarimo'tkazuvchlar orasidagi bog'lanish kattaligi.	Kirish va chiqish qismidan olinadigan fizik kattaliklari	<ol style="list-style-type: none"> 1) Signal bor yoki yoqligi ; 2) Yarimo'tkazgichli elementlarni ishdan chiqishi; 3) Mantik funksiyalar amali bajarilimasligi.

Nazorat savollari

1. Mantiqiy elementlarning vazifasi?
2. Mantiqiy algebrasining asosiy tushunchasi?
3. Mantiqiy elementlar qanday belgilanadi?
4. Qanaqa mantiq funksiyalari mavjud?

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