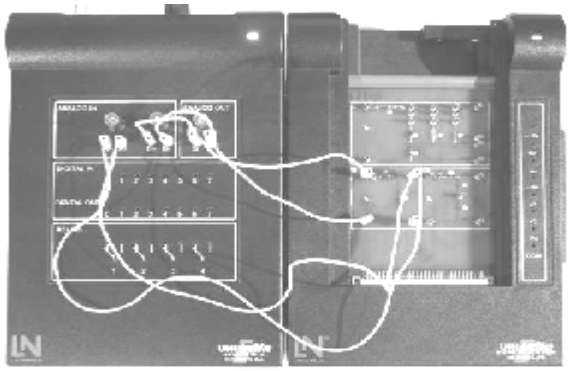
O’ZBEKISTON RESPUBLIKASI
OLIY VA O’RTA MAXSUS TA’LIM VAZIRLIGI

O’RTA MAXSUS, KASB-HUNAR TA’LIMI MARKAZI
SURXONDARYO VILOYATI HOKIMLIGINIG O’RTA MAXSUS
KASB-HUNAR TA’LIMI BOSHQARMASI

«*ELEKTRONIKA I* »

FANIDAN

AMALIY MASHG`ULOTLAR TO`PLAMI



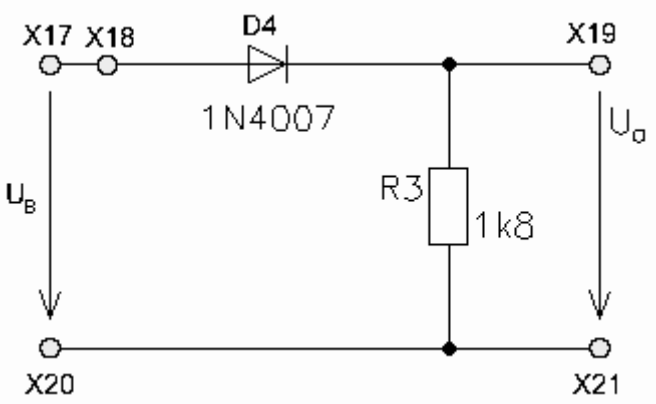
Termiz

1 Amaliy mashgulot 2 soatga muljallangan

Klapan effekti

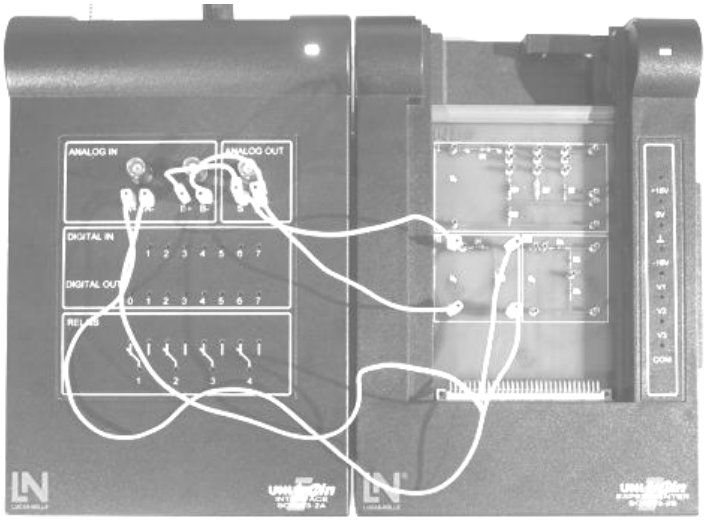
Ushbu sodda tajriba diodning fundamental xususiyatlarini, uning klapan sifatidagi faoliyatini ko'rsatadi. Sxema avvalo musbat o'zgarmas tok kuchlanishi bilan, so'ngra esa manfiy o'zgarmas tok kuchlanishi bilan ta'minlanadi. Har bir holatda chiqish kuchlanishi o'lchanadi.

Sxema



Tartibi

1. Eksperimentatorni UniTrain-I ning Interfeysi bilan ulang va *SO4203-7A* "Diodlar" tajriba platasini o'rnating II tajribalar maydonini UniTrain-I Interfeysi bilan sxema diagrammasida va ulanishlar ro'yxatida ko'rsatilganidek ulang:



Ulanishlar ro'yxati

Dan	*Ga*
Interfeys S	Terminal X17
Interfeys GND	Terminal X20
Interfeys S	Ulang B +
Interfeys GND	Interfeys B-
Ulang A+	Terminal X19
Interfeys A -	Terminal X21

2. Uskunalar menyusidan quyidagi virtual uskunalarni oching
   - O'ZGARMAS TOK manbai
   - A Voltmetri
   - B Voltmetri

O'rnatilishlar

O'ZGARMAS TOK manbai	Tokka ulangan, Voltmetr B 10 V ni ko'rsatmaguncha

va ularni jadvalda ko’rsatilganidek sozlang.

	amplitudani ko’paytiring
A Voltmetri **Va**	Analog Diapazon 20 V O’ZGARMAS TOK va AV
B Voltmetri **Vb**	Analog Diapazon 10 V O’ZGARMAS TOK va AV

3. R3 rezistori bo’ylab chiqish kuchlanishini o’lchang va uni tegishli darchaga kiriting.

1 natija

V

Chiqish kuchlanishi

4. O’ZGARMAS TOK manbaini manfiy kuchlanishga o’rnating. Sxemani o’zgartirishga yoki Voltmetrni o’rnatishga hojat yo’q.

O’rnatilishlar

O’ZGARMAS TOK manbai	Tokka ulangan, B Voltmetri 10V kattaligini ko’rsatmaguncha amplitudani kamaytiring (Minus LED chirog’i yoniq)

6. Baholash:
Ushbu ikkala kuchlanish o’lchovini qanday tushuntirasiz?

Natija varaqasi Ismi_____

1.Tayanch sexemani to`g`ri tuzish

1. **O`lchov**

Ua = chiqish kuchlanish
Ue = kirish kuchlanishi
Ro = teskari bog`lanish qarshiligi
R1 = qo`shimcha qarshilik
V = operatsion kuchaytrgichning kuchayish koeffsenti.

2.1

2.2

2.3
Javob:_____

_____

2.4
Javob:_____

_____

_____

Formula : _____

<a`lo> : 85 – 100 ball; <yaxshi > : 70 – 84 ball:
<qaoniqarli > : 55- 69 ball; <qaoniqarsiz >: 55 balldan past

amaliy mashg'ulot
o`lchovlaring baholari

1.(maksimal ball 25)

Ball:_____

2.1 (Ua va v uchun 10 balldan, maksimal 20 ball)

Ball:_____

2.2 (Ua va v uchun 2 balldan , maksimal 20 ball)

Ball:_____

2.3(maksimal 15 ball)

Ball:_____

2.4 (javob 15 ball, formula 5 ball maksimal 20 ball)

Ball:_____

Jami Ball:_____

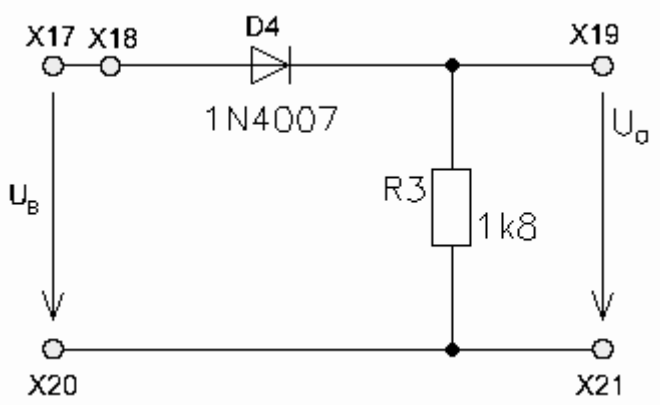
Imzo:_____

2 Amaliy mashgulot 2 soatga muljallangan

Rektifikatsiya (to`g`rilash, yo`naltirish) effekti

Ushbu sodda tajriba diodning eng asosiy qo'llanishlaridan biri bo'lmish, o'zgaruvchan kuchlanishni to'g'rilash usulini ko'rsatadi. Sxema o'zgaruvchan kuchlanishli tok manbai va ostsillografda o'lchangan chiqish kuchlanishi bilan ta'minlangan.

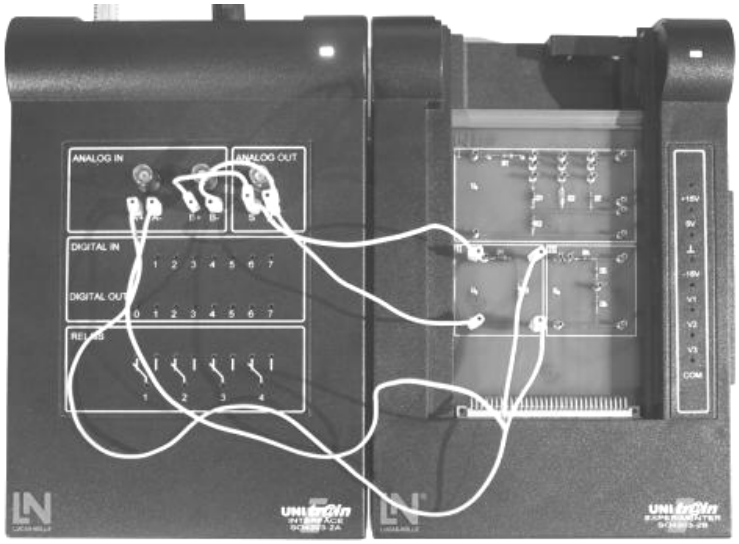
Sxema



Tartibi

Siz avvalgi tajribadagidek xuddi o'sha sxemadan foydalanishingiz mumkin ("diodning klapan effekti"), oshanda 2 -qadamga kirinshingiz oson ko'chadi;

1. Eksperimentatorni UniTrain-I ning Interfeysi bilan ulang va *SO4203-7A* "Diodlar" tajriba platasini o'rnating II tajribalar maydonini UniTrain-I Interfeysi bilan sxema diagrammasida va ulanishlar ro'yxatida ko'rsatilganidek ulang:



Ulanishlar ro'yxati

Dan	*Ga*
Interfeys S	Terminal X17
Interfeys GND	Terminal X20
Interfeys S	Ulang B +
Interfeys GND	Interfeys B-
Interfeys A+	Terminal X19
Interfeys A -	Terminal X21

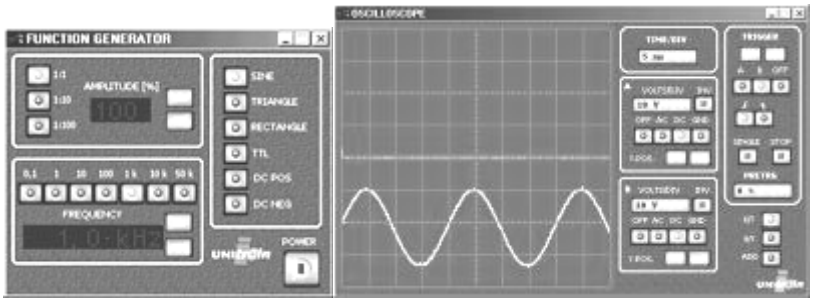
2. Har ehtimolga ko'ra ochgan virtual uskunalarni yoping. Uskunalar menyusidan quyidagi virtual uskunalarni oching

O'rnatilishlar

Funktsiya	Tokka

- Funktsiya generatori
- Ostsillograf

va ularni jadvalda ko’rsatilganidek sozlang.



generatori	ulangan, Amplituda 100 % 1:1da Chastota 50 gts sinus tolqin
Ostsillograf A Kanali **Va**	5V /birlik O’zgarmas tokka ulanish
Ostsillograf B kanali **Vb**	5V / birlik
Asosiy vaqt ostsillografi va trigger	Rejim X/T 5 ms / birlik Trigger B

3. R3 rezistori boyicha $\mathbf{V_b}$ kirish kuchlanishini va $\mathbf{V_a}$ chiqish kuchlanishini o’lchash uchun ostsillografdan foydalaning va ostsillograf natijalarini yonidagi maydonga kiriting. Shuningdek ostsillograf o’rnatilishlarini tegishli maydonga kiriting.

TIME/Div : ☐

CHNA/Div : ☐

CHNB/Div : ☐

V_e : ☐ V_{pp}

f_e : ☐ Gts

V_a : ☐ V_p

Ulanish : ☐

4. Baholash:
   Kuchlanishning qayd qilingan izlarini qanday tushuntirasiz?

Natija varaqasi Ismi_____

1.Tayanch sexemani to`g`ri tuzish

2. O`lchov

Ua = chiqish kuchlanish
Ue = kirish kuchlanishi
Ro = teskari bog`lanish qarshiligi
R1 = qo`shimcha qarshilik
V = operatsion kuchaytrgichning kuchayish koeffsenti.

2.1

2.2

2.3
Javob:_____

_____

2.4
Javob:_____

_____

_____

Formula : _____

<a`lo> : 85 – 100 ball; <yaxshi > : 70 – 84 ball:
<qaoniqarli > : 55- 69 ball; <qaoniqarsiz >: 55 balldan past

amaliy mashg'ulot
o`lchovlaring baholari

1.(maksimal ball 25)

Ball:_____

2.1 (Ua va v uchun 10 balldan, maksimal 20 ball)

Ball:_____

2.2 (Ua va v uchun 2 balldan , maksimal 20 ball)

Ball:_____

2.3(maksimal 15 ball)

Ball:_____

2.4 (javob 15 ball, formula 5 ball maksimal 20 ball)

Ball:_____

Jami Ball:_____

Imzo:_____

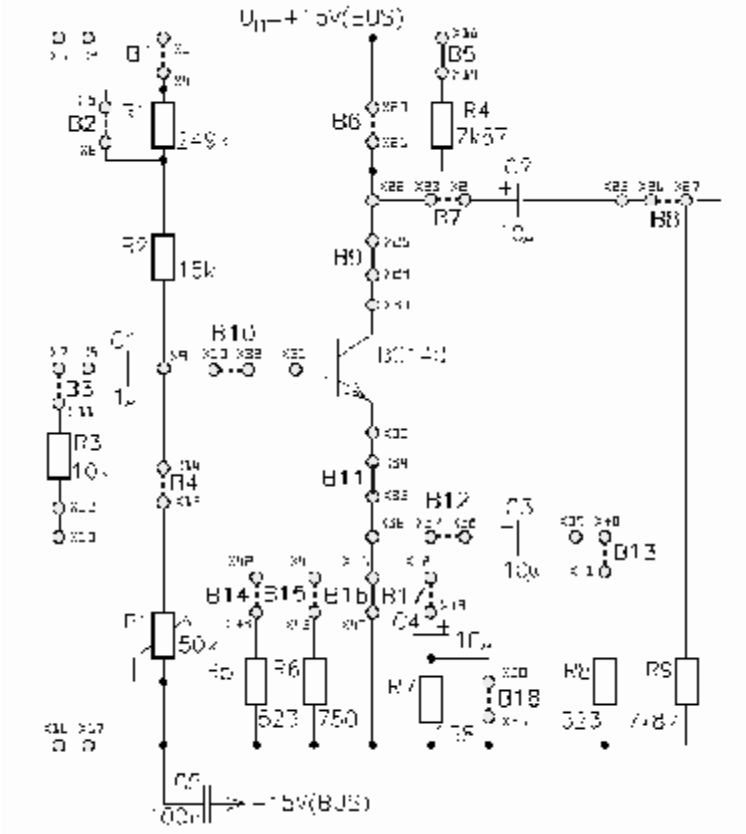
3 Amaliy mashgulot 2 soatga muljallangan

Tranzistordan qayta ulagich sifatida foydalanish

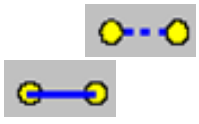
Tranzistor sxemalari

Ushbu tajriba umumiy emitter sxemasining qayta ulagich (switch) sifatida qanday ishlatilishini ko'rsatadi. Bu tranzistorning O'zgarmas tokdagi turli holatini ko'rsatadi. Tranzistor o'tkazmayotganida **X22** dagi kuchlanish tok manbai kuchlanishiga R4 rezistori orqali musbat shinaga ulanganligi uchun teng bo'lishi kerak. Agar tranzistor to'liq o'tkazayotgan bo'lsa, har holda terminal tranzistor orqali nol volt shinasiga ulanadi va agar tranzistorning ichki qarshiligi R4 dan ancha past bo'lsa , chiqish terminalidagi kuchlanish nolga yaqinlashgan holda tushishi kerak. Bu faqat bazaga yetarli kuchlanish qo'llanilib, bazaga yetarli zaryad tashuvchilar emitter va baza o'rtasida tokning oqishi uchun kirganda yuz beradi. Ushbu hodisa ro'y beradigan kattalik tajriba orqali aniqlanadi.

Kirish kattaligiga erishilganda kuchlanish tezda tushishi ham kuzatiladi. O'zining ikki g'ayritabiiy holatlarida chiqish to'yinadi. Ushbu holatlarda tranzistor **to'liq ulangan** yoki **to'liq o'chirilgan** bo'ladi deyish mumkin.



Tajriba:



: jamper o`rnatilgan
: jumper o`natilmagan

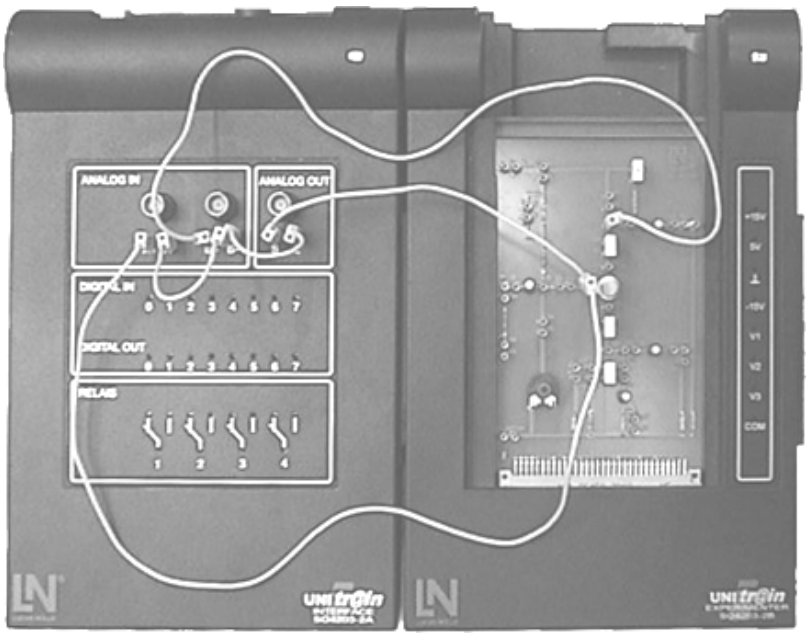
1. Experimantatorni UniTrain-I ning Interfeysi bilan ulang SO4203-7E *Tranzistorning asosiy sxemasi* tajribalar platasini o'rnating.

   Sxema diagrammasida ko'rsatilganidek jamperlarni o'rnating va platani UniTrain-I Interfeysi bilan ulanishlar

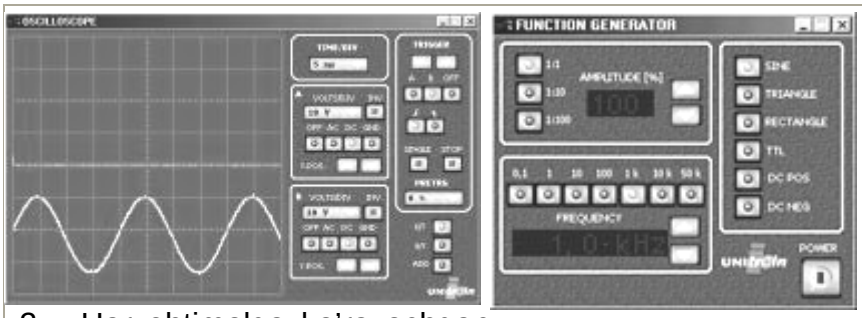
Ulanishlar ro'yxati

Dan	Ga
Terminal X31	Interfeys A+
Interfeys (GND)	Interfeys A-

ro’yxatida o’rsatilganidek ulang



Terminal X22	*Interfeys B+*
Interfeys (GND)	*Interfeys B-*
Interfeys S (ANALOG Chiqish)	*Terminal X31*
Interfeys (GND)	*Terminal 16/17* (Yer avval UniTr@in shinasi orqali ulanganligi uchun tushirib qoldirilgan bo’lishi mumkin)
15V li elektr manbai UniTr@in shinasi orqali ta’minlangan	
Jamperlar	
B5, B9, B11, B16	
*B5 Terminallar **X18-X19***	*B9 Terminallar **X28-X29***
*B11 Terminallar **X34-X35***	*B16 Terminallar **X46-X47***



2. Har ehtimolga ko’ra ochgan hamma virtual uskunalarni yoping va Uskunalar Menyusidan quyidagi virtual uskunalarni loching:

– Funktsiya generatori

– Ostsillograf

va ularni jadvalda ko’rsatilganidek sozlang.

O’rnatilishlar

Funktsiya generatori	Amplituda **1:10** (boshlang’ich 0%) O’zgarmas tok rejimi **POS** Tokka ulangan
Ostsillograf	*A Voltlar/birligi **500mV O’zgarmas tok Qizil**,* *B Voltlar/bir **5V O’zgarmas tok Ko’k**,* *Vaqt/bir **1s**,* ***X/T Rejimi**,* *Trigger **B, tushayotgan qirra, 7.5 V*** *Pre-trigger (PRETRG) **50% Bitta***

3. Diagrammadagidek shuhday emitterning umumiy sxemasini quringki, unda bazadagi kuchlanish to’liq ravishda funktsiya generatori bilan aniqlansin. Funktsiya generatorining kuchlanish nisbatini **1:10** ga ravishda shunday o’rnatingki, bazadagi maksimum kuchlanish 1V ni ko’rsatsin. 0% kuchlanish bilan boshlangda, uni iloji boricha tezroq 100% ga ko’taring. Agar hamma narsa ko’rsatilganidek o’rnatilgan bo’lsa, ostsillograf triggar bo’ladi va izlarni ko’rsatadi.Izlarni ko’chiring va pastdagi bo’limga kiriting.

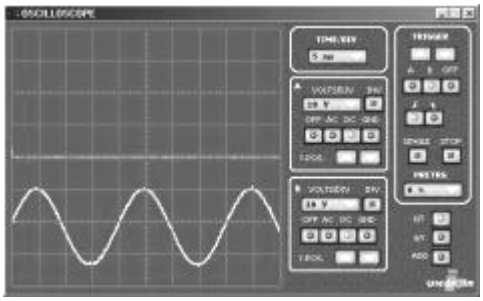
:

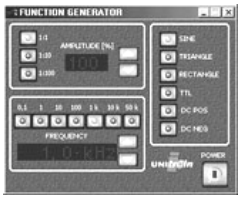
A Volt birl

B Volt birl

Ulanish A:

Ulanish B:





4. Keyingi tajriba uchun virtual uskunalarning o'rnatilishlari qo'shma jadvalga muvofiq o'zgartirilishi kerak.

O'rnatilishlar

Funktsiya generatori	**1:10** (= 1 V, ya'ni 2 volt pikdan-pikka- 2 Vpp) **da** amplituda **100%** Uchburchak rejimi Chastota **1 gts** Tokka ulangan
Ostsillograf	*A Voltlar/bir **500mV** **O'zgarmas tok Qizil**, B Voltlar/bir **5V** **O'zgarmas tok Ko'k**, VAQT/BIR **200 ms**, Rejim **X/T**, Trigger **B, tushayotgan qirra, 7.5 V** Pre-trigger (PRETRG) **25%** **Bitta***

5. Tranzistorning qayta ulanish effektini boshqa usulda kuzatish uchun funktsiya generatoridan uchburchak signal tranzistor bazasiga to'g'ridan to'g'ri kirish signali bo'lishi mumkin. Tanlangan to'lqin shakllari chiziqli ravishda – 1V dan +1V ga ko'tarilishi, so'ngra +1V dan yana orqaga -1V ga chiziqli ravishda(to'g'ri chiziqda) tushishi mumkin. Bu har bir sekundda takrorlangan. It can thus be seen that the transistor switches on and the voltage between collector and emitter drops to zero whenever the input rises above the threshold value of the transistor. Shunday qilib tranzistorning qayta ulanishi va tranzistorning kirish kattaliklaridan kirish ko'tarilganda kollektor va emitter o'rtasidagi kuchlanish nolga tushishi ko'rinishi mumkin. Ostsillografning vaqt birligini **200 ms** ga qo'ying, so'ngra funktsiya generatorining TOKKA ULAGICHINI yoqing va kuchlanish izlarini ostsillograf bilan qayd qiling. Izlarni pastdagi bo'limga ko'chiring. So'ngra ikkita izlarning kuzatishlaridan kelib chiqadigan savolga javob bering.

:

A $\frac{\text{Volt}}{\text{birl}}$

B $\frac{\text{Volt}}{\text{birl}}$

Ulanish A:

Ulanish B:

6. Bazadagi kuchlanish qaysi kattalikdan baland bo'lganda tranzistor to'liq o'tkazadi?

Kirish kuchlanishi V_t V

Natija varaqasi Ismi_____

1.Tayanch sexemani to`g`ri tuzish

3. O`lchov

Ua = chiqish kuchlanish
Ue = kirish kuchlanishi
Ro = teskari bog`lanish qarshiligi
R1 = qo`shimcha qarshilik
V = operatsion kuchaytrgichning kuchayish koeffsenti.

2.1

2.2

2.3
Javob:_____

_____

2.4
Javob:_____

_____

_____

Formula : _____

<a`lo> : 85 – 100 ball; <yaxshi > : 70 – 84 ball:
<qaoniqarli > : 55- 69 ball; <qaoniqarsiz >: 55 balldan past

amaliy mashg'ulot
o`lchovlaring baholari

1.(maksimal ball 25)

Ball:_____

2.1 (Ua va v uchun 10 balldan, maksimal 20 ball)

Ball:_____

2.2 (Ua va v uchun 2 balldan , maksimal 20 ball)

Ball:_____

2.3(maksimal 15 ball)

Ball:_____

2.4 (javob 15 ball, formula 5 ball maksimal 20 ball)

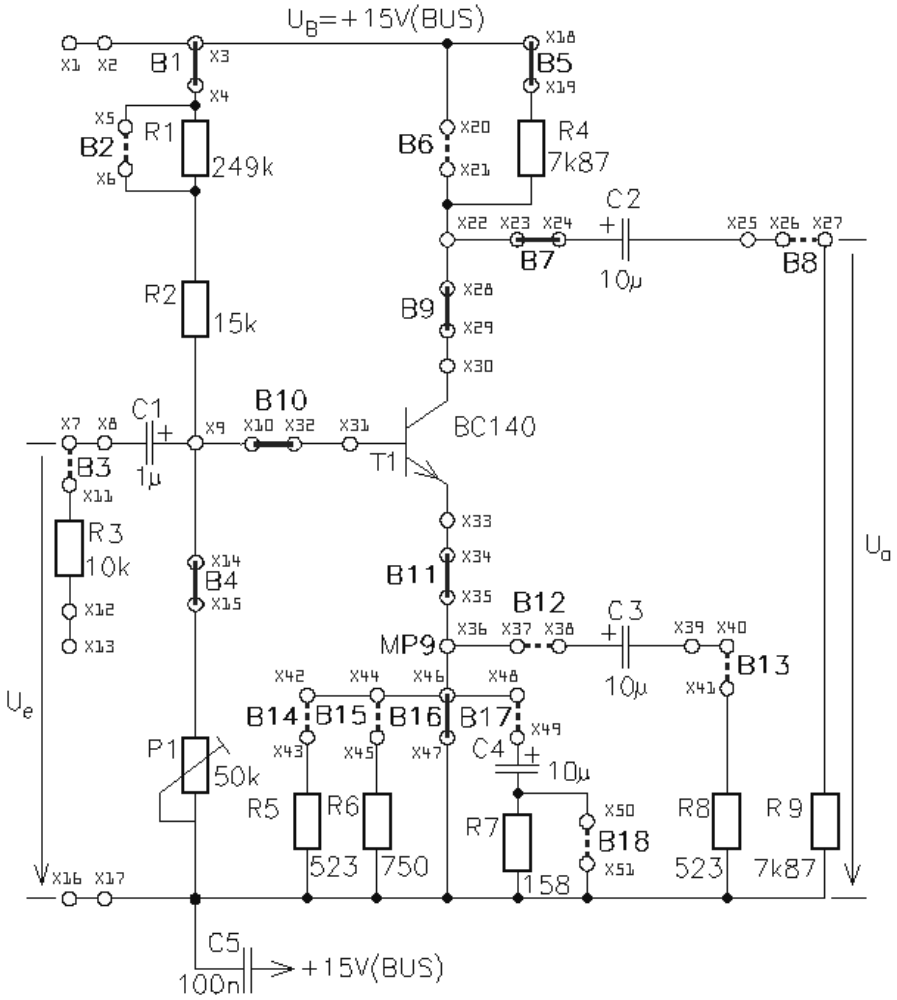
Ball:_____

Jami Ball:_____

Imzo:_____

4 Amaliy mashgulot 2 soatga muljallangan

Emitterning



teskari aloqasiz umumiy sxemasi

Tranzistor sxemalari

Ushbu tajribada emitterning umumiy sxemasi yordamida signalning kuchaytirilishini tadqiq qilinadi.

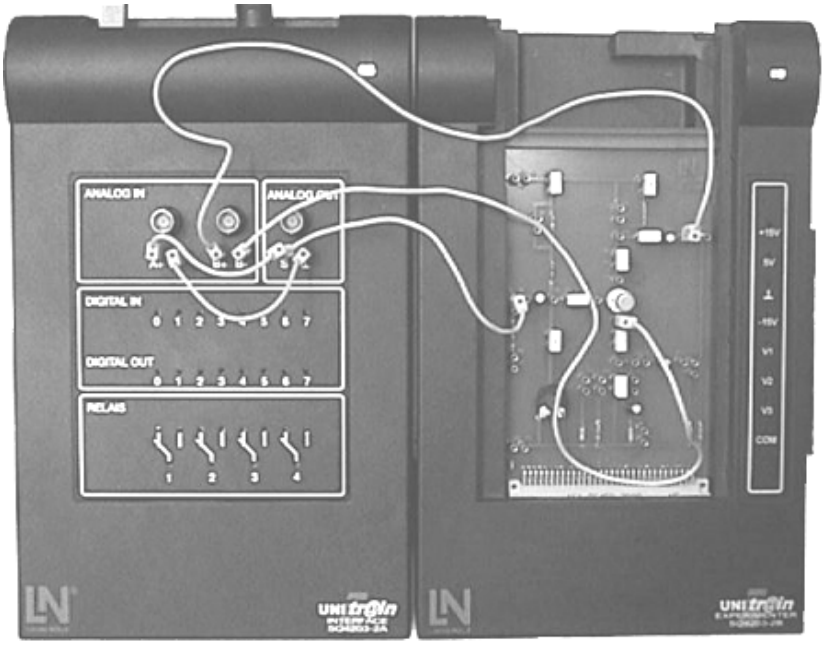
Tartibi

1. Experimantatorni UniTrain-I ning Interfeysi bilan ulang SO4203-7E *Tranzistorning asosiy sxemasi* tajribalar platasini o'rnating.

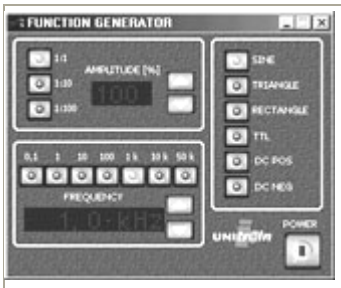
Sxema diagrammasida ko'rsatilganidek to'g'ri chiziqlar bilan jamperlarni o'rnating va platani UniTrain-I Interfeysi bilan ulanishlar ro'yxatida ko'rsatilganidek ulang

Ulanishlar ro'yxati

From	*To*
Interface S (ANALOG chiqish)	*Terminal X8*
Interface ⊥(ANALOG chiqish)	*Terminal X16/17 (tushirib qoldirilishi mumkin)*
Interface S (ANALOG chiqish)	*Interface A+*



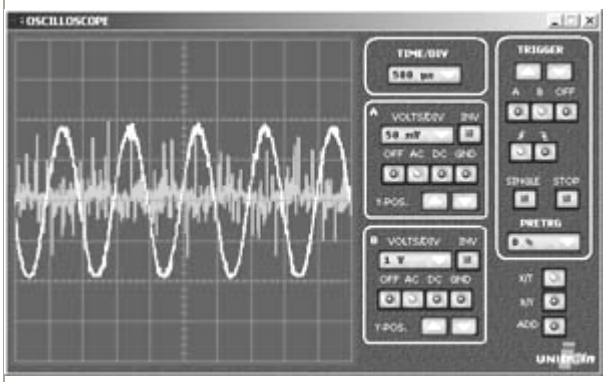
Interface ⊥(ANALOG chiqish)	*Interface A-*
Terminal X25	*Interface B+*
Terminal X33	*Interface B-*
Jamperlar	
B1, B4, B5, B7, B9, B10, B11, B16	
B1 Terminallar X3-X4	*B4 Terminallar X14-X15*
B5 Terminallar X18-X19	*B7 Terminallar X23-X24*
B9 Terminallar X28-X29	*B10 Terminallar X10-X32*
B11 Terminallar X34-X35	*B16 Terminallar X46-X47*



2. Har ehtimolga ko'ra ochgan hamma virtual uskunalarni yoping va Uskunalar Menyusidan quyidagi virtual uskunalarni oching:
   - Voltmetr A
   - Voltmetr B
   - Funktsiya generatori
   - Ostsillograf (avval voltmetrlarni yoping)

va ularni jadvalda ko'rsatilganidek sozlang.

Voltmetrlar va ostsillograf bir vaqtning o'zida ishlatilishi mumkin bo'lmaganligi tufayli o'rnatilgan voltmetr bilan bir ish maydonini va ostsillografning o'rnatilishi bilan boshqa ish maydonini saqlab turish maqsadga muvofiq bo'ladi. So'ngra, har doim VU larni ochib yopishning va ularning o'rnatilishlarini sozlash o'rniga ish maydonlari o'rtasini qayta ulashingiz mumkindir.



O'rnatilishlar

Voltmetr A	Diapazon **100mV da**, O'zgaruvchan tok va **Vpp**,
Voltmetr B	Diapazon **20Vda**, O'zgarmas tok va **AV** operatsion nuqta o'lchovlari uchun, O'zgaruvchan tok va **Vpp** kuchayish o'lchovlari uchun,
Ostsillograf	A Voltlar/bir **50mV O'zgaruvchan tok Qizil**, B Voltlar/bir **2V O'zgaruvchan tok Ko'k**, Vaqt/bir **500µs**, Rejim **X/T**, Trigger **B,** ko'tariladigan qirra
Funktsiya generatori	**1:100 da** kuchlanish **10%** Chastota **1kgts** Sinus rejimi Tokka ulangan

3. B voltmetrini oching va uni **X22-X33** tranzistorining kollektor va emitteri bo'ylab $\mathbf{V_{CE}}$

O’zgarmas tok kuchlanishini o’lchash uchun o’rnating. Potentsiometrni burish yo’li bilan tranzistor almashuvini kuchlanish tok manbai kuchlanishining taqriban yarmiga teng bo’lguncha sozlang.
Ushbu tartib oldingi tajribadgi operatsion nuqtani o’rnatishga o’xshash. Chiqish kuchlanishini ko’pga o’zgartirish uchun potentsiometrning ozgina harakati kifoyaligini va bu harakat ehtiyotkorlikni talab qilishini hisobga oling.

4. Operatsion nuqta o’rnatilgandan so’ng, voltmetrni yoping va ostsillografni yuqorida ko’rsatilgan o’rnatilishi bilan oching .**1 kgts** chastotaning **50 mV sinus to’lqin** signalini tranzistorning bazasiga kiritish uchun funktsiya generatoridan foydalaning va buni ostsillografning A kanaliga qayd qiling. (qo’shimcha shovqinli signallarga e’tibor qilmang) **X25** va ostsillografning **B** kanali yeri **(X33 yoki X16/17)** o’rtasidagi chiqish kuchlanishini qayd qiling – chiqish **V_a X25-X33.** Chiqishning C2 kondensatorining uzoq masofali tomonidan olingan o’zgaruvchan kuchlanishligi, shuning uchun o’zgarmas tok darajalari hisobga olinmaganligini e’tiborga oling. O’lchov yetakchisini) operatsion nuqta uchun o’zgarmas tok kuchlanishi darajasini o’lchagan (X22) kollektor tomonidan siljitishni unutmang. Funktsiya generatoridagi kuchlanishni yuqoriga ko’taring va chiqish signalining chetlashish nuqtasiga qachon yetishini kuzating. Qaysi nuqtada signal endi sinus to’lqin shakliga ega bo’lmasligini o’zingiz hal qilishingiz kerak. Ostsillograf izlarini pastdagi bo’limga tushirish va ko’tarish yo’li bilan ko’chiring.

1- bo’lim

TIME / Div :
CHN A / Div :
CHN B / Div :
f_i :
ulanish A:
ulanish B:

5. X25-X33 - chiqish bo’ylab Vpp kuchlanishni o’lchash uchun B voltmetridan foydalaning. A voltmetridan foydalangan holda **X8** va **X16** o’rtasida yoki to’g’ridan to’g’ri analog chiqishidan kirish kuchlanishini o’lchang. So’ngra, sxema kuchayishini aniqlash uchun chiqish kuchlanishini kirish kuchlanishiga taqsimlang.

Kirish kuchlanishi V_e ____ mV_{pp}
Chiqish kuchlanishi V_a ____ V_{pp}
Kuchayish ____

6. Voltmetrlarni yoping va yana ostsillografni oching. A kanalidagi kirish kuchlanishini va kollektor bilan B kanalidagi X25-X33 yeri ortasidagi chiqish kuchlanishini avvaldagidek qayd qiling.

7. Tranzistorni uni puflash yo’li bilan yoki soch quritadigan fen bilan qizdiring (uni to’g’ridan to’g’ri olov bilan qizdirmang). Ostsillografning kirish va chiqish kanallari natijali izlarini

pastdagi bo'limga ko'chiring.

2- bo'lim

TIME / Div :

CHN A / Div :

CHN B / Div :

f_i :

ulanish A:

ulanish B:

B voltmetridan foydalangan holda, operatsion nuqtani, (X22) kollektor va (X33) emitteri o'rtasidagi O'zgarmas tok kuchlanishini o'lchang. Tranzistorning isitilishi uning kattaligiga qanday ta'sir qildi?

V_{CE} operatsion nuqta (isitilgunga qadar) =

V_{CE} operatsion nuqta (isitilgandan so'ng) =

9. X25-X33 - chiqish bo'ylab Vpp kuchlanishni o'lchash uchun B voltmetridan foydalaning. A voltmetridan foydalangan holda **X8** va **X16** o'rtasida yoki to'g'ridan to'g'ri analog chiqishidan kirish kuchlanishini o'lchang. So'ngra, sxema kuchayishini aniqlash uchun chiqish kuchlanishini kirish kuchlanishiga taqsimlang.

Kirish kuchlanishi V_e mV_{pp}

Chiqish kuchlanishi V_a V_{pp}

Kuchayish

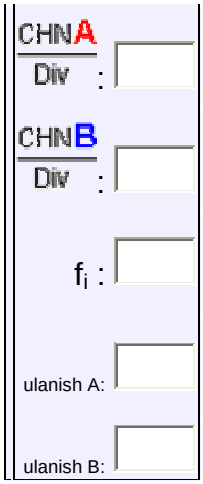
10. Tranzistor isitilishining qanday effektlari bor?

11. B voltmetridan foydalanib, tranzistorning (X22) kollektor va (X33) emitteri bo'ylab, **V_{CE}** O'zgarmas tok kuchlanishini o'lchang. Potentsiometrni burish yo'li bilan kuchlanish taqriban 2V bo'lguncha tranzistor almashuvuni sozlang

12. Operatsion nuqta o'rnatilgandan so'ng, voltmetrni yoping va ostsillografni yuqorida ko'rsatilgan o'rnatilishi bilan oching .**1 kgts** chastotaning **50 mV sinus to'lqin** signalini tranzistorning bazasiga kiritish uchun funktsiya generatoridan foydalaning va buni ostsillografning A kanaliga qayd qiling. (qo'shimcha shovqinli signallarga e'tibor qilmang) **X25** va ostsillografning **B** kanali yeri **(X33 yoki X16/17)** o'rtasidagi chiqish kuchlanishini qayd qiling – chiqish **V_a X25-X33**.

3- bo'lim

TIME / Div :



13. Operatsion nuqta o'rnatilgandan so'ng, voltmetrni yoping va ostsillografni yuqorida ko'rsatilgan o'rnatilishi bilan oching .**1 kgts** chastotaning **50 mV sinus to'lqin** signalini tranzistorning bazasiga kiritish uchun funktsiya generatoridan foydalaning va buni ostsillografning A kanaliga qayd qiling. (qo'shimcha shovqinli signallarga e'tibor qilmang) **X25** va ostsillografning **B** kanali yeri **(X33 yoki X16/17)** o'rtasidagi chiqish kuchlanishini qayd qiling – chiqish **V_a X25-X33**.

Kirish kuchlanishi V_e _____ mV_{pp}

Chiqish kuchlanishi V_a _____ V_{pp}

Kuchayish _____

14. Siz qayd qilgan ostsillograf izlari xususiyatlarini solishtiring. Emitter umumiy sxemasi uchun bironta muvofiq qo'llanishni bering.

Natija varaqasi Ismi_____

1.Tayanch sexemani to`g`ri tuzish

4. O`lchov

Ua = chiqish kuchlanish
Ue = kirish kuchlanishi
Ro = teskari bog`lanish qarshiligi
R1 = qo`shimcha qarshilik
V = operatsion kuchaytrgichning kuchayish koeffsenti.

2.1

2.2

2.3
Javob:_____

_____

2.4
Javob:_____

_____

_____

Formula : _____

<a`lo> : 85 – 100 ball; <yaxshi > : 70 – 84 ball:
<qaoniqarli > : 55- 69 ball; <qaoniqarsiz >: 55 balldan past

amaliy mashg'ulot
o`lchovlaring baholari

1.(maksimal ball 25)

Ball:_____

2.1 (Ua va v uchun 10 balldan, maksimal 20 ball)

Ball:_____

2.2 (Ua va v uchun 2 balldan , maksimal 20 ball)

Ball:_____

2.3(maksimal 15 ball)

Ball:_____

2.4 (javob 15 ball, formula 5 ball maksimal 20 ball)

Ball:_____

Jami Ball:_____

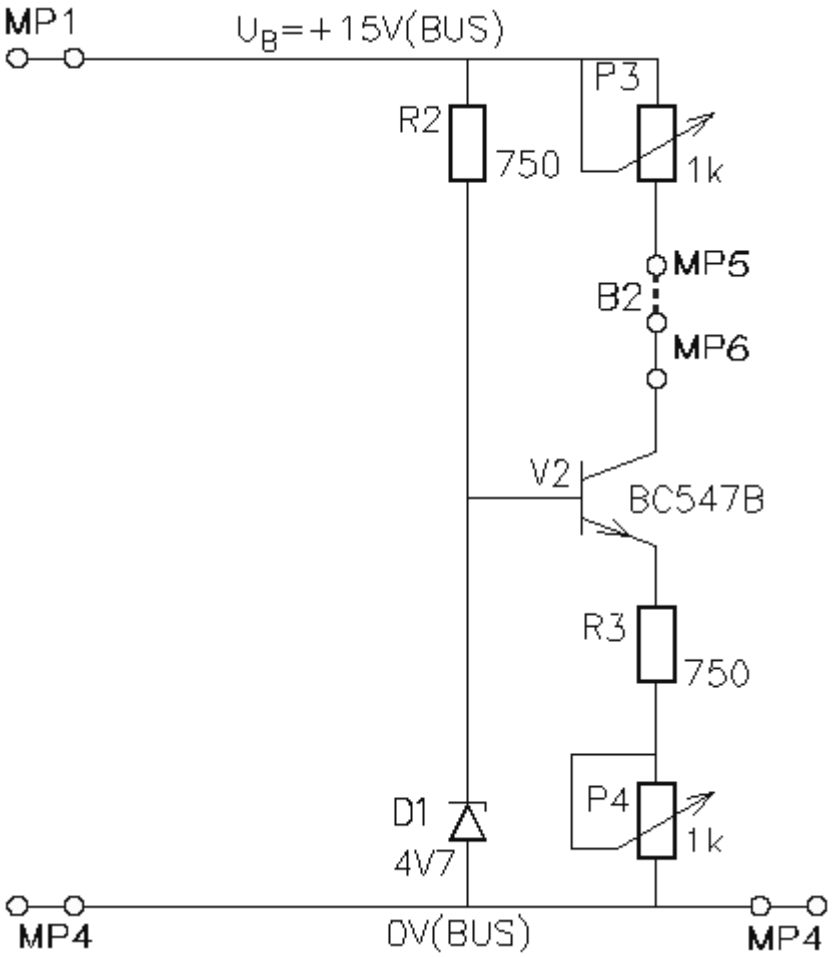
Imzo:_____

5 Amaliy mashgulot 2 soatga muljallangan

Bipolyr tranzistorli o`zgarmas tok manbai

Ushbu tajriba o`zgarmas tok manbai sxemasining xususiyatlarini ko'rib chiqadi.

Tajriba o'rnatilishi



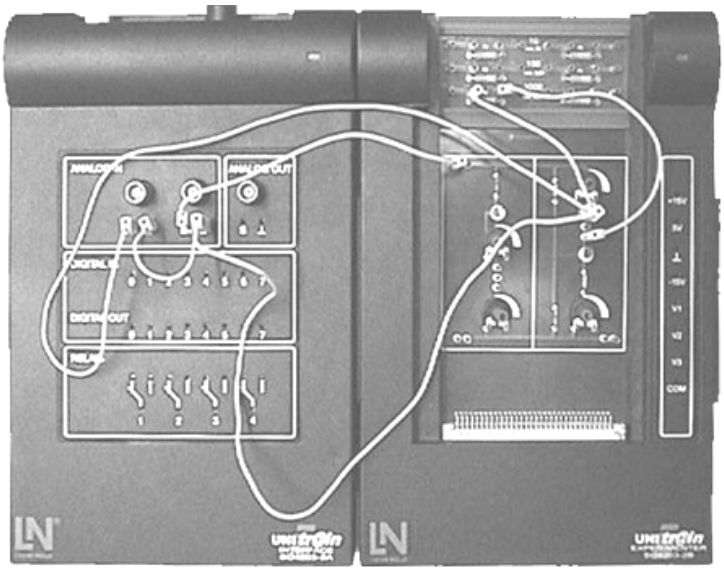
Tartibi

1. Experimentatorni UniTrain-I interfeysiga ulang va SO4201-8G."Tok manbalari" tajriba platasini o'rnating.

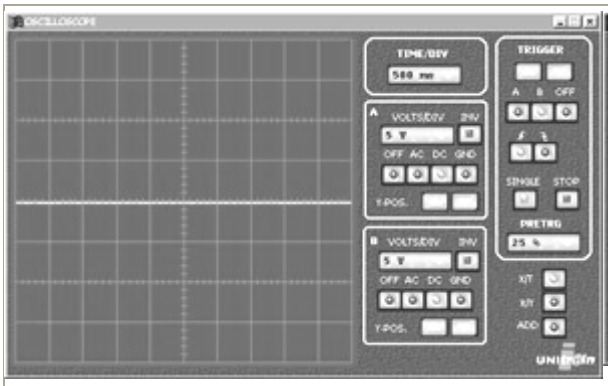
   Talab qilingan jamperlarni o'rnating va platani UniTrain-I ning interfeysi bilan ulanishlar ro'yxatida ko'rstilgandek ulang

Ulanishlar ro'yxati

Dan	*Ga*
Interface B-	*Interface A+*
Terminal MP6	*Interface A-*
Terminal MP5	*Shuntlar X10*
Terminal MP6	*Shuntlar X11*



Terminal MP5	Interface B-



2. lga ko’ra ochgan hamma virtual uskunalarni yoping va Uskunalar menyusidan quyidagi virtual uskunalarni oching

- A ampermetri (yoki MetraHit multimetri)
- Ostsillograf
- va ularni jadvalda ko’rsatilganidek sozlang (Izoh: Ostsillograf va ampermetr bir vaqtning o’zida ishlatilishi mumkin emas. L@Bsoft ish maydonidagi o’rnatilishlarni saqlab turish foydalidir.)

O’rnatilishlar

MetraHit (qo’shimcha)	**mA** ni o’lchash uchu o’rnating (shuntni tushirib qoldiring)
Ostsillograf	**A** Voltlar/bo’l **20mV** Qizil, **B** Voltlar/bo’l **5V** Ko’k, Ulanish A/B O’zgarmas tok manbai, Vaqt/bir **1s**, Rejim **X/T**, Trigger: **B, 10V, ko’tariladigan qirra** Pretrg: **75%**
A Ampermetri	Diapazon **10mA O’ZGARMAS TOK VA O’ZGARUVCHAN KUCHLANISH** Shunt **100 Om**

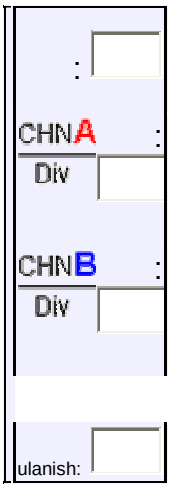
3. B2 ga ulangan 100 omli shunt rezistoriga parallel ulangan virtual ampermetrdan, yoki alternativ ravishda milliamperlarni o’lchash uchun o’rnatilgan MetraHit multimetri(keyingi holatda shunt uzoqlashtirilishi shart) vositasidan foydalanib maksimum va minimum tokni o’lchang.P3 potentsiometri sxema yuklanmasligi uchun faqat chapga burilishi zarur. P4 potentsiometridan foydalanib maksimum va minimum toklarni aniqlang.

Maksimum tok = _____ mA

Minimum tok = _____ mA

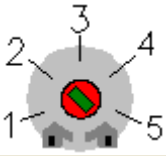
4. P3 potentsiometrini sxemada yuklanish bo'lmasligi uchun faqat chapga buring. A ampermetri yoki MetraHit multimetri bilan o'lchangan B2 dagi tok maksimumda bo'lishi uchun P4 potentsiometrini sozlang. So'ngra agar siz ampermetrdan foydalanib kelayotgan bo'lsangiz uni yoping va ostsillografni oching.
   A kanalidagi shunt rezistori bo'ylab kuchlanishni o'lchang.Bu sxemada o'tayotgan tokni ko'rsatadi.
   O'sha vaqtning o'zida ostsillografni doimiy vaqt asosiga o'rnatib soat strelkasi bo'yicha burilayotgan P3 bo'ylab kuchlanishni qayd qiling. Pastdagi joyga ostsillogrammani ko'chiring.

katak 1



5. A kanalini kuzatishingiz bilan, R5 dagi qarshilik kuchayayotganda sxemadagi tok to'g'risida nima deya olasiz? .Boshlang'ich tokni maksimumining yarmiga qo'ygan holda tajribani yana takrorlang. Natija avvalgidekmi?

6. Siz allaqachon foydalanib(I_{max} va $I_{max}/2$), bo'lgan ikkita boshlang'ich tok o'rnatilishlarining har biri uchun, qo'shma jadvalda ko'rsatilgan maxsus yuklanish o'rnatilishlari uchun chiqish tokini aniq o'lchang. O'rnatilishlar jadval yuqorisidagi diagrammada ko'rsatilgan P3 ning pozitsiyalariga to'g'ri keladi.



Pozitsiya	Tok $I_{max}/2$ [mA]	Tok I_{max} [mA]
1		
2		
3		
4		
5		

7.Ushbu turdagi o`zgarmas tok manbaili sxema qanday qilib ishlashi mexanizmini tasvirlang.

Natija varaqasi Ismi_____

1.Tayanch sexemani to`g`ri tuzish

5. O`lchov

Ua = chiqish kuchlanish
Ue = kirish kuchlanishi
Ro = teskari bog`lanish qarshiligi
R1 = qo`shimcha qarshilik
V = operatsion kuchaytrgichning kuchayish koeffsenti.

2.1

2.2

2.3
Javob:_____

_____

2.4
Javob:_____

_____

_____

Formula : _____

<a`lo> : 85 – 100 ball; <yaxshi > : 70 – 84 ball:
<qaoniqarli > : 55- 69 ball; <qaoniqarsiz >: 55 balldan past

amaliy mashg'ulot
o`lchovlaring baholari

1.(maksimal ball 25)

Ball:_____

2.1 (Ua va v uchun 10 balldan, maksimal 20 ball)

Ball:_____

2.2 (Ua va v uchun 2 balldan , maksimal 20 ball)

Ball:_____

2.3(maksimal 15 ball)

Ball:_____

2.4 (javob 15 ball, formula 5 ball maksimal 20 ball)

Ball:_____

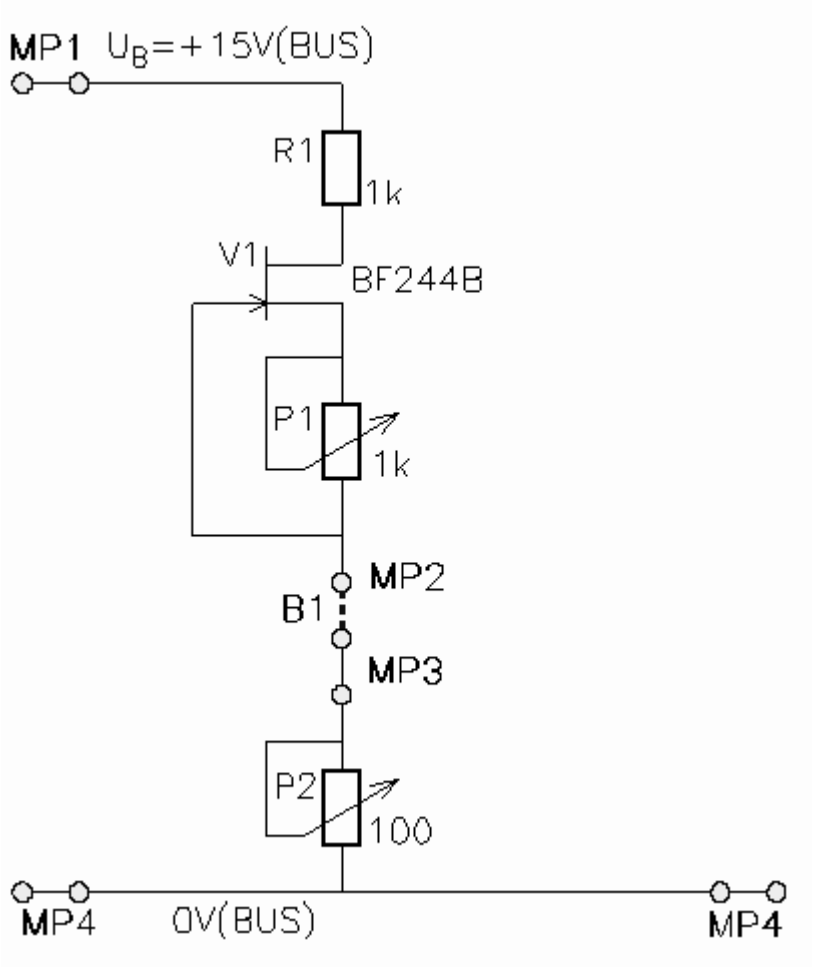
Jami Ball:_____

Imzo:_____

6 Amaliy mashgulot 2 soatga muljallangan
(FET) Maydon tranzistorli o`zgarmas tok manbai

Ushbu tajriba o`zgarmas tok manbai sxemasining xususiyatlarini ko’rib chiqadi.

Tajriba o’rnatilishi



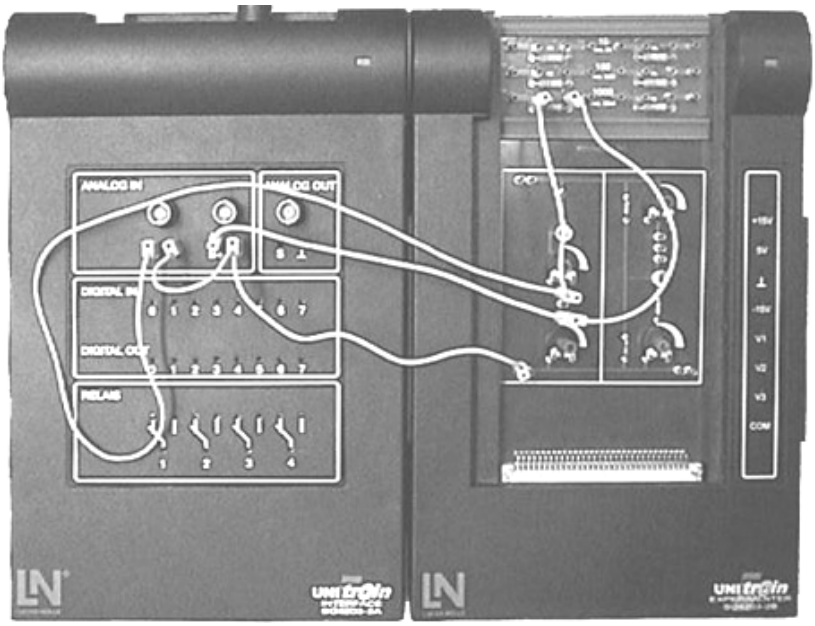
Tartibi

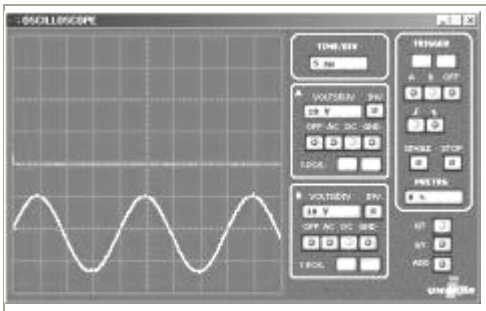
1. Experimentatorni UniTrain-I interfeysiga ulang va SO4201-8G.”Tok manbalari” tajriba platasini o’rnating.

   Jamperlarni sxema diagrammasida ko’rsatilganidek to’g;ri chiziqlar bilan o’rnating va platani UniTrain-I ning interfeysi bilan ulanishlar ro’yxatida ko’rstilgandek ulang

Ulanishlar ro’yxati

Dan	*Ga*
Terminal MP2	*Interface A+*
Interface B+	*Interface A-*
Terminal MP2	*Shunlar X6*
Terminal MP3	*Shuntlar X7*
Terminal MP3	*Interface B+*
Terminal MP4	*Interface B-*





2. Har ehtimolga ko'ra ochgan hamma virtual uskunalarni yoping va Uskunalar menyusidan quyidagi virtual uskunalarni oching

   - A ampermetri (yoki MetraHit multimetri)
   - Ostsillograf
   - va ularni jadvalda ko'rsatilganidek sozlang

   (Izoh: Ostsillograf va ampermetr bir vaqtning o'zida ishlatilishi mumkin emas. L@Bsoft ish maydonidagi o'rnatilishlarni saqlab turish foydalidir..)

O'rnatilishlar

MetraHit (qo'shimcha ravishda)	**mA** ni o'lchash uchun o'rnating (shuntni tushirib qoldiring)
Ostsillograf	**A** Voltlar/bo'l **20mV** Qizil, **B** Voltlar/bo'l **5V** Ko'k, Ulanish A/B O'zgarmas tok, Vaqt/bir **1s**, Rejim **X/T**, Trigger: **B, 10V, ko'tariladigan qirra** Pretrg: **75%**
A ampermetri	Diapazon **10mA O'ZGARMAS TOK VA O'ZGARUVCHAN KUCHLANISH** Shunt **100 oms**

3. B2 ga ulangan 100 omli shunt rezistoriga parallel ulangan virtual ampermetrdan, yoki alternativ ravishda milliamperlarni o'lchash uchun o'rnatilgan MetraHit multimetri(keyingi holatda shunt uzoqlashtirilishi shart) vositasidan foydalanib maksimum va minimum tokni o'lchang.P2 potentsiometri sxema yuklanmasligi uchun faqat chapga burilishi zarur. P1 potentsiometridan foydalanib maksimum va minimum toklarni aniqlang.

Maksimum tok = _____ mA

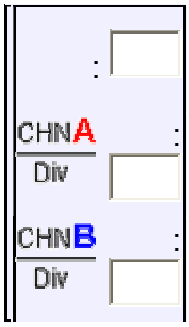
Minimum tok = _____ mA

4. P2 potentsiometrini sxemada yuklanish bo'lmasligi uchun faqat chapga buring. A ampermetri yoki MetraHit multimetri bilan o'lchangan B1 dagi tok maksimumda bo'lishi uchun P1 potentsiometrini sozlang. So'ngra agar siz ampermetrdan foydalanib kelayotgan bo'lsangiz uni yoping va ostsillografni oching.

A kanalidagi shunt rezistori bo'ylab kuchlanishni o'lchang.Bu sxemada o'tayotgan tokni ko'rsatadi.

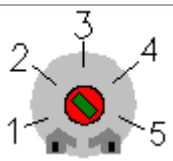
O'sha vaqtning o'zida ostsillografni doimiy vaqt asosiga o'rnatib soat strelkasi bo'yicha burilayotgan P2 bo'ylab kuchlanishni qayd qiling. Pastdagi joyga ostsillogrammani ko'chiring.

Kataklar 1



5. A kanalini kuzatishingiz bilan, R2 dagi qarshilik kuchayayotganda sxemadagi tok to'g'risida nima deya olasiz? .Boshlang'ich tokni maksimumining yarmiga qo'ygan holda tajribani yana takrorlang. Natija avvalgidekmi?

6. Siz allaqachon foydalanib(I_{max} va $I_{max}/2$), bo'lgan ikkita boshlang'ich tok o'rnatilishlarining har biri uchun, qo'shma jadvalda ko'rsatilgan maxsus yuklanish o'rnatilishlari uchun chiqish tokini aniq o'lchang. O'rnatilishlar jadval yuqorisidagi diagrammada ko'rsatilgan P2 ning pozitsiyalariga to'g'ri keladi.



Pozitsiya	Tok $I_{max}/2$ [mA]	Tok I_{max} [mA]
1		
2		
3		
4		
5		

7. Ushbu turdagi o`zgarmas tok manbaili sxemaning ishlash mexanizmini tasvirlang.

Natija varaqasi Ismi_____

1.Tayanch sexemani to`g`ri tuzish

6. O`lchov

Ua = chiqish kuchlanish
Ue = kirish kuchlanishi
Ro = teskari bog`lanish qarshiligi
R1 = qo`shimcha qarshilik
V = operatsion kuchaytrgichning kuchayish koeffsenti.

2.1

2.2

2.3
Javob:_____

_____

2.4
Javob:_____

_____

_____

Formula : _____

<a`lo> : 85 – 100 ball; <yaxshi > : 70 – 84 ball:
<qaoniqarli > : 55- 69 ball; <qaoniqarsiz >: 55 balldan past

amaliy mashg'ulot
o`lchovlaring baholari

1.(maksimal ball 25)

Ball:_____

2.1 (Ua va v uchun 10 balldan, maksimal 20 ball)

Ball:_____

2.2 (Ua va v uchun 2 balldan , maksimal 20 ball)

Ball:_____

2.3(maksimal 15 ball)

Ball:_____

2.4 (javob 15 ball, formula 5 ball maksimal 20 ball)

Ball:_____

Jami Ball:_____

Imzo:_____

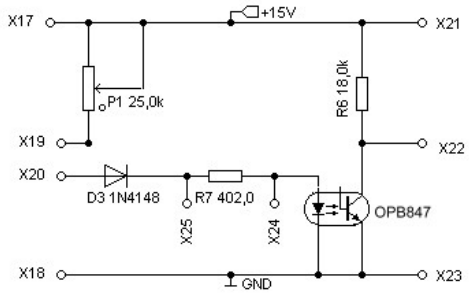
7 Amaliy mashgulot 2 soatga muljallangan

Infra-qizil indikatorlar

Optoelectronika / Infra-qizil indikatorlarning xususiyatlari

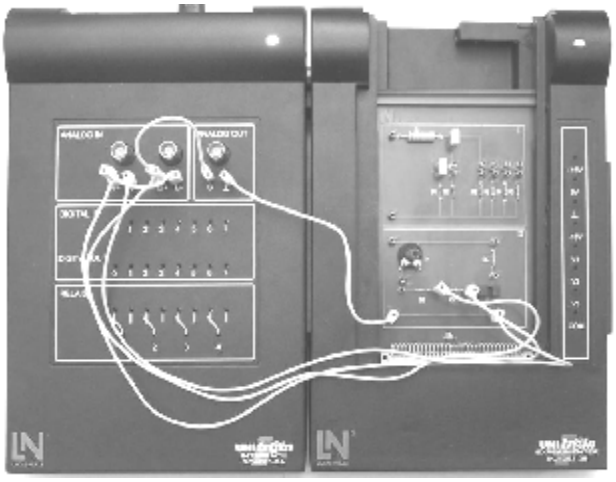
Infra-qizil indikatorlarning o'tkazuvchi va o'tkazmaydigan xususiyatlari dinamik ravishda UniTrain-I ning Diodlar kursidagi Kremniy diodlarining xususiyatlari dagidek qayd qilinadi.

Sinusoid o'zgaruvchan kuchlanish X25 da kirish kuchlanishidir. Tokka proportsional bo'lgan R7 bo'ylab kuchlanish keyinchalik ostsillografning B kanalida o'lchanadi, vaholanki diod bo'ylab kuchlanish A kanalida o'lchanadi .



Tartibi

1. Eksperimentatorni UniTrain-I ning Interfeysi bilan ulang va *SO4203-7C* "Zener diodlari" tajriba platasini o'rnating. II tajribalar maydonini UniTrain-I Interfeysi bilan sxema diagrammasida va ulanishlar ro'yxatida ko'rsatilganidek ulang.



Ulanishlar ro'yxati

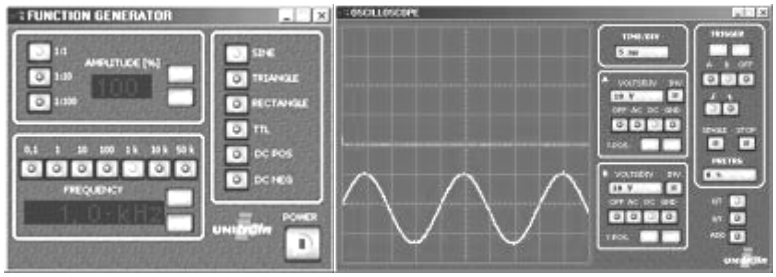
Dan	*Ga*
Interfeys S	Terminal X25
Interfeys GND	Terminal X18
Interfeys B+	Terminal X25
Interfeys B-	Terminal X24
Interfeys A+	Terminal X24
Interfeys A-	Terminal X23

2. Close any virtual instruments you may have open and open the following virtual instruments from the *Instruments* menu:
   - Function generator and
   - Oscilloscope

   and adjust them as shown in the table.

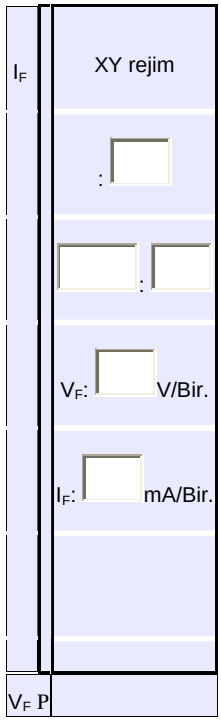
O`rnatilishlar

Funktsiya generatori	Tokka ulangan, Amplituda 100% 1:1da 10 gts liChastota Sinus to'lqin
Ostsillografning A kanali	0.5 V / bir O'zgarmas tok



V_F	manbaiga ulanish
Oscilloscope Channel B V_{IF}	2 V / bir O'zgarmas tok manbaiga ulanish
Vaqt asosidagi ostsillograf va trigger	Rejim X/Y 10 ms / bir Trigger A

3. Infra-qizil diodning xususiyatlari: Virtual ostsillografdan ostsillogrammani pastdagi bo'shliqqa sichqoncha ko'zlangan joyni belgilamaguncha barmog'ingiz bilan sichqonchaning chap knopkasini bosgan holda tushiring, so'ngra knopkani qo'yib yuboring. Siz ushbu jarayonni takrorlashingiz va eng so'nggi ostsillogrammani tajribaning natijasi sifatida saqlab qolishingiz mumkin. Diod toki va kuchlanishi uchun ma'lumotlarni berilgan maydonga kiriting.



4. Kuchlanish manfiy bo'lganda kirish kuchlanishi va uzilish kuchlanishi qanday? Kirish kuchlanishi asosida indikatorning rangi qanaqa?

5. Ushbu xususiyatlar va kremniy diodining xususiyatlari o'rtasida qanday farq bor?

Natija varaqasi Ismi_____

1.Tayanch sexemani to`g`ri tuzish

7. O`lchov

Ua = chiqish kuchlanish
Ue = kirish kuchlanishi
Ro = teskari bog`lanish qarshiligi
R1 = qo`shimcha qarshilik
V = operatsion kuchaytrgichning kuchayish koeffsenti.

2.1

2.2

2.3
Javob:_____

_____

2.4
Javob:_____

_____

_____

Formula : _____

<a`lo> : 85 – 100 ball; <yaxshi > : 70 – 84 ball:
<qaoniqarli > : 55- 69 ball; <qaoniqarsiz >: 55 balldan past

amaliy mashg'ulot
o`lchovlaring baholari

1.(maksimal ball 25)

Ball:_____

2.1 (Ua va v uchun 10 balldan, maksimal 20 ball)

Ball:_____

2.2 (Ua va v uchun 2 balldan , maksimal 20 ball)

Ball:_____

2.3(maksimal 15 ball)

Ball:_____

2.4 (javob 15 ball, formula 5 ball maksimal 20 ball)

Ball:_____

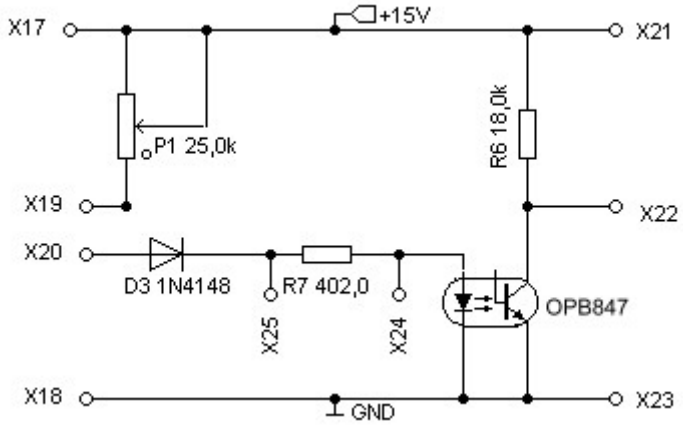
Jami Ball:_____

Imzo:_____

8 Amaliy mashgulot 2 soatga muljallangan
Fototranzistor

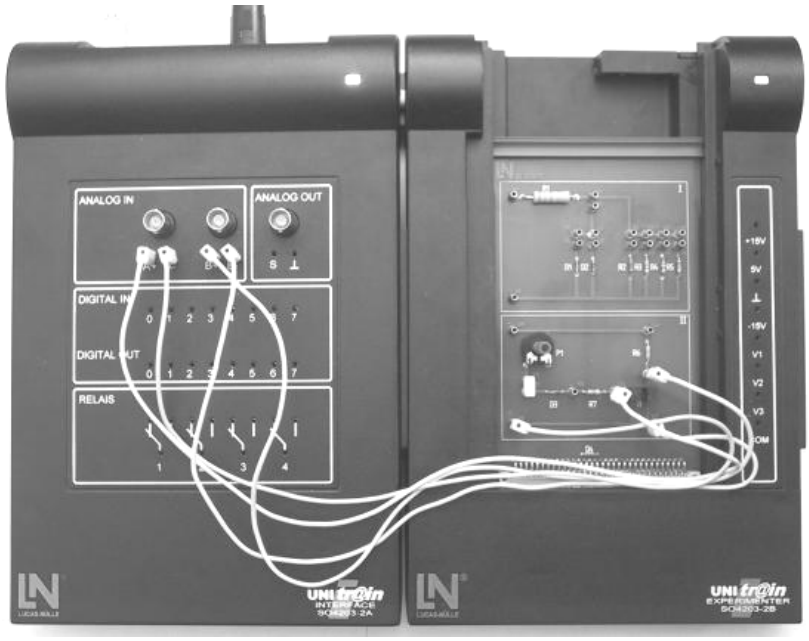
Opto-electronika / Fototranzistorlar

Ushbu tajriba fototranzistordagi kollektor-emitter kuchlanishining I_{D3} indikatoridagi tokka bog'liqligini ko'rsatadi. Diod orqali tok qadam baqadam ko'paytiriladi va har bir qadam uchun fototranzistor bo'ylab V_{CE} kuchlanish o'lchanadi va jadvalga kiritiladi.



Tartibi

1. Eksperimentatorni UniTrain-I ning Interfeysi bilan ulang va *SO4203-7C* "Zener diodlari" tajriba platasini o'rnating.
   II tajribalar maydonini UniTrain-I Interfeysi bilan sxema diagrammasida va ulanishlar ro'yxatida ko'rsatilganidek ulang



Ulanishlar ro'yxati

Dan	*Ga*
Jamper	Terminallar X19-X20
Interfeys A+	Terminal X25
Interfeys A-	Terminal X24
Interfeys B+	Terminal X22
Interfeys B-	Terminal X23

2. Har ehtimolga ko'ra ochgan hamma virtual uskunalarni

O`rnatilishlar

yoping.Uskunalar menyusidan quyidagi virtual uskunalarni oching
- A ampermetri,
- B voltmetri

va ularni jadvalda ko'rsatilganidek sozlang.

Potentiometer	Faqat chapga
A Ampermetri **I_F**	Shunt 402 om Diapazon 12mA O'zgarmas tok manbai va AV
Voltmetr B **V_{CE}**	Analog Diapazon 20V O'zgarmas tok manbai va AV

3. Pastda berilgan o'lchovlarni bajaring. Jadvalda ko'rsatilgan dioddagi tokka kattaliklar berish uchun potentsiometrni har bir qadamda moslang.
Ikkita virtual uskunalar yordamida **V_{CE}** tranzistor bo'ylab kuchlanishni va **I_F** diod orqali tokni o'lchang.Kattaliklarni jadvalga kiriting.
Hamma o'lchovlarni muvaffaqiyat bilan kiritib, jadvalni Diagramma rejimiga o'tkazing.

4. Baholash:

Funktsiya grafigining shaklini tushuntiring.

5. Evaluation:

Fototranzistor umuman o'tkazmaydigan diod toki uchun va tranzistor to'liq ulangandagi tok uchun kirish kattaliklarini aniqlang

Quyidagidan kelib chiqqan holda tranzistorni ulash yoki ochirish uchun talab qilingan kirish tokini hisoblab chiqing:

$V_E = 402\ Om * I_F + V_F$

Kollektor tokini va diod tokidagi CTR (Tok uzatish nisbati) ni hisoblang

$I_F = 3\ mA$:

$I_C = (15\ V - V_{CE}) / 18\ kilohms$

$CTR = I_C / I_F$

Natija varaqasi Ismi_____

1.Tayanch sexemani to`g`ri tuzish

8. O`lchov

Ua = chiqish kuchlanish
Ue = kirish kuchlanishi
Ro = teskari bog`lanish qarshiligi
R1 = qo`shimcha qarshilik
V = operatsion kuchaytrgichning kuchayish koeffsenti.

2.1

2.2

2.3
Javob:_____

_____

2.4
Javob:_____

_____

_____

Formula : _____

<a`lo> : 85 – 100 ball; <yaxshi > : 70 – 84 ball:
<qaoniqarli > : 55- 69 ball; <qaoniqarsiz >: 55 balldan past

amaliy mashg'ulot
o`lchovlaring baholari

1.(maksimal ball 25)

Ball:_____

2.1 (Ua va v uchun 10 balldan, maksimal 20 ball)

Ball:_____

2.2 (Ua va v uchun 2 balldan , maksimal 20 ball)

Ball:_____

2.3(maksimal 15 ball)

Ball:_____

2.4 (javob 15 ball, formula 5 ball maksimal 20 ball)

Ball:_____

Jami Ball:_____

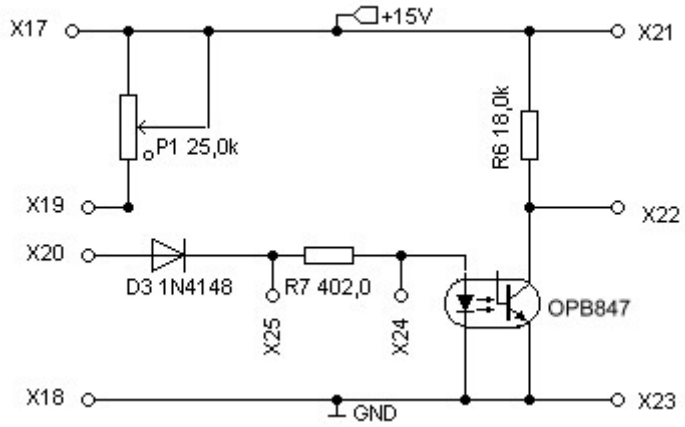
Imzo:_____

9 Amaliy mashgulot 2 soatga muljallangan

Optron

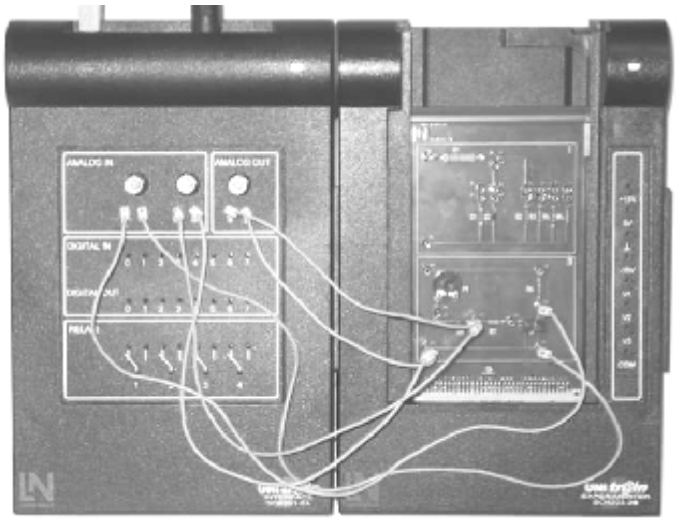
Optoelectronika / Optronlar

Vilka tipidagi yoruglik to'siqlaridan endi optronlar sifatida foydalaniladi. To'gri burchakli kirish signali funktsiya generatoridan va X20 terminaliga kirishdan foydalangan holda hosil qilinishi kerak. Ostsillografdan X22 dagi chiqishni o'lchashda foydalanish zarur.
Ushbu jarayon qayta ulanish ta'sirini va sxemaning cheklovchi chastotalarini kuzatish uchun har xil chastotalarda takrorlanadi.



Tartibi

1. Eksperimentatorni UniTrain-I ning Interfeysi bilan ulang va *SO4203-7C* "Zener diodlari" tajriba platasini o'rnating.
   II tajribalar maydonini UniTrain-I Interfeysi bilan sxema diagrammasida va ulanishlar ro'yxatida ko'rsatilganidek ulang:



Ulanishlar ro'yxati

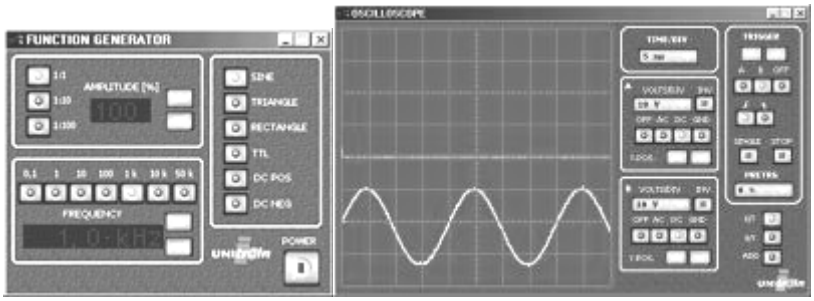
Dan	*Ga*
Interfeys S	Terminal X25
Interfeys GND	Terminal X18
Interfeys B+	Terminal X25
Interfeys B-	Terminal X18
Interfeys A+	Terminal X22
Interfeys A-	Terminal X23

2. Har ehtimolga ko'ra ochgan hamma virtual uskunalarni yoping.Uskunalar menyusidan quyidagi virtual

O'rnatilishlar

uskunalarni oching
- Funktsiya generatori,
- Ostsillograf

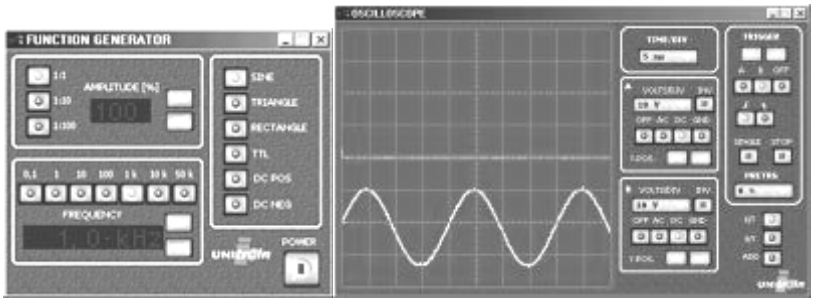
va ularni jadvalda ko’rsatilganidek sozlang.



Function generator	Power ON, Amplitude 35% at 1:1 Frequency 100 Hz Square
Oscilloscope Channel A V_{CE}	5V / div DC coupling
Oscilloscope Channel B V_F	2V / div DC coupling
Oscilloscope Time-base and trigger	Mode X/Y 2ms / div Trigger B

3. Chiqish kuchlanishi 100 Gts da:
Virtual ostsillografdan ostsillogrammani pastdagi bo’shliqqa sichqoncha ko’zlangan joyni belgilamaguncha barmog’ingiz bilan sichqonchaning chap knopkasini bosgan holda tushiring, so’ngra knopkani qo’yib yuboring. Siz ushbu jarayonni takrorlashingiz va eng so’nggi ostsillogrammani tajribaning natijasi sifaida saqlab qolishingiz mumkin. Diod toki va kuchlanishi uchun ma’lumotlarni berilgan maydonga kiriting.

4. Funktsiya generatori va ostsillograf o’rnatilishlari uchun quyidagi o’zgartirishlar bajaring:



O’rnatilishlar

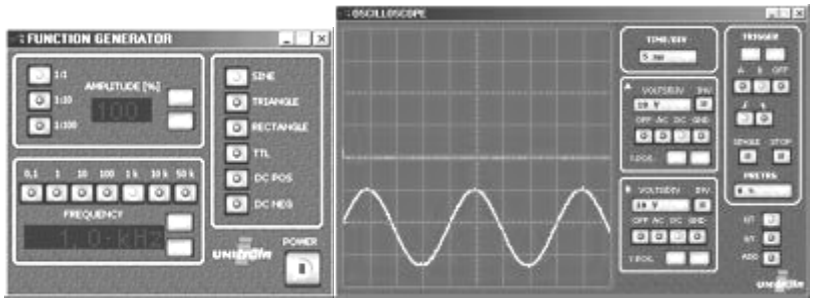
Funktsiya generatori	Chastota 1 kGts
Vaqtga asoslangan ostsillograf va trigger	0.2 ms / bir

5. Chiqish kuchlanishi 1 kGts da:
Virtual ostsillografdan ostsillograf izlarini pastdagi bo’shliqqa sichqoncha ko’zlangan joyni belgilamaguncha barmog’ingiz bilan sichqonchaning chap knopkasini bosgan holda tushiring, so’ngra knopkani qo’yib yuboring. Siz ushbu jarayonni takrorlashingiz va eng so’nggi ostsillogrammani tajribaning natijasi sifaida saqlab qolishingiz mumkin. Diod toki va kuchlanishi uchun ma’lumotlarni berilgan maydonga kiriting.

6. Funktsiya generatori va ostsillograf o’rnatilishlari uchun quyidagi o’zgartirishlar bajaring:

O’rnatilishlar

Funktsiya generatori	Chastota 10 kGtsda
Vaqtga asoslangan ostsillograf va trigger	20µs / bir



7. Chiqish kuchlanishi 10 kgts da:
Virtual ostsillografdan ostsillograf izlarini pastdagi bo'shliqqa sichqoncha ko'zlangan joyni belgilamaguncha barmog'ingiz bilan sichqonchaning chap knopkasini bosgan holda tushiring, so'ngra knopkani qo'yib yuboring. Siz ushbu jarayonni takrorlashingiz va eng so'nggi ostsillogrammani tajribaning natijasi sifaida saqlab qolishingiz mumkin. Diod toki va kuchlanishi uchun ma'lumotlarni berilgan maydonga kiriting.

8. Ostsillografning 3 -izi: Kirish va chiqish kuchlanishlarining holati qanday?
Ostsillografning 5 va 7-izlarida chiqish kuchlanishi qanday o'zgaradi?

Natija varaqasi Ismi_____

1.Tayanch sexemani to`g`ri tuzish

9. O`lchov

Ua = chiqish kuchlanish
Ue = kirish kuchlanishi
Ro = teskari bog`lanish qarshiligi
R1 = qo`shimcha qarshilik
V = operatsion kuchaytrgichning kuchayish koeffsenti.

2.1

2.2

2.3
Javob:_____

_____

2.4
Javob:_____

_____

_____

Formula : _____

<a`lo> : 85 – 100 ball; <yaxshi > : 70 – 84 ball:
<qaoniqarli > : 55- 69 ball; <qaoniqarsiz >: 55 balldan past

amaliy mashg'ulot
o`lchovlaring baholari

1.(maksimal ball 25)

Ball:_____

2.1 (Ua va v uchun 10 balldan, maksimal 20 ball)

Ball:_____

2.2 (Ua va v uchun 2 balldan , maksimal 20 ball)

Ball:_____

2.3(maksimal 15 ball)

Ball:_____

2.4 (javob 15 ball, formula 5 ball maksimal 20 ball)

Ball:_____

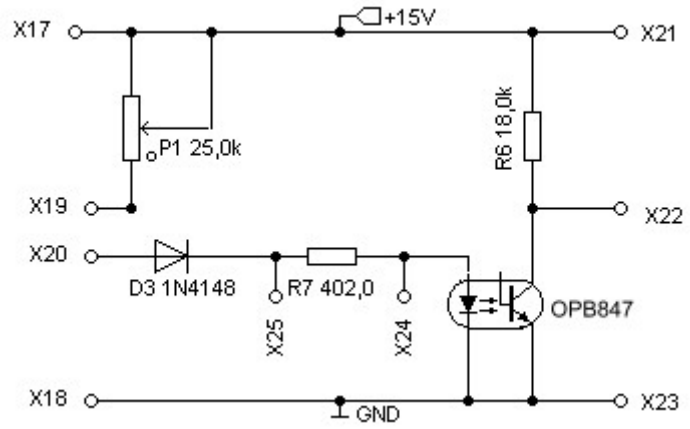
Jami Ball:_____

Imzo:_____

10 Amaliy mashgulot 2 soatga muljallangan
Vilka tipidagi yorug'lik to'sig'i

Optoelectronika / Vilka tipidagi yorug'lik to'sig'i

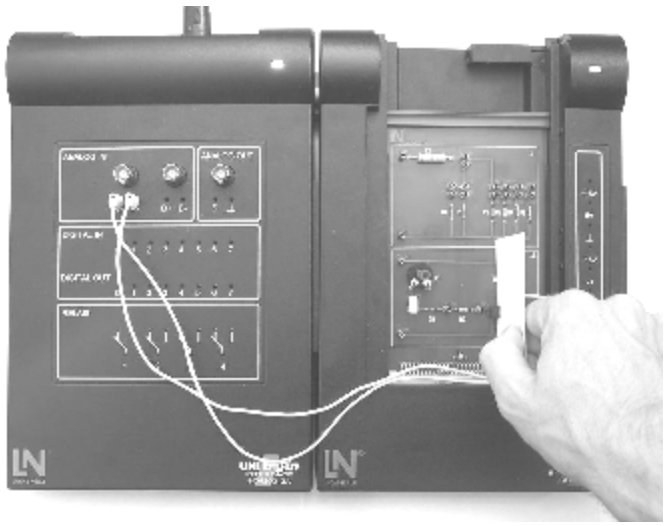
Endi biz vilka tipidagi yorug'lik to'sig'ining amaldagi funktsional imkoniyatlarini ko'rib chiqamiz. P1 potentsiometri orqali va X22 chiqishidagi kuchlanish yordamida moslanadigan, hamda diod orqali hosil qilinadigan doimiy tok ostsillograf bilan o'lchanadi. Har xil materiallar, jumladan qog'oz yoki qora hoshiyali belgilangan folgalar vilka orqali tortiladi. P1 dan foydalangan holda uning sezgirligi sozlanadi.



Tartibi

1. Eksperimentatorni UniTrain-I ning Interfeysi bilan ulang va *SO4203-7C* "Zener diodlari" tajriba platasini o'rnating.

   II tajribalar maydonini UniTrain-I Interfeysi bilan sxema diagrammasida va ulanishlar ro'yxatida ko'rsatilganidek ulang:



Ulanishlar ro'yxati

Dan	*Ga*
Jamper	Terminallar X19-X20
Interfeys B+	Terminal X25
Interfeys B-	Terminal X24
Interfeys A+	Terminal X22
Interfeys A-	Terminal X23

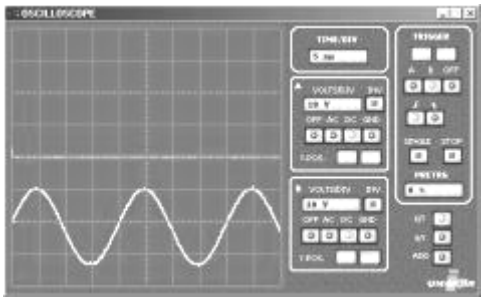
2. Close any virtual instruments you may have open and open the following virtual instruments from the *Instruments* menu:

O'rnatilishlar

Ostsillografning	10 V / bir

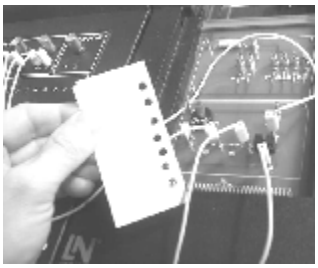
- Oscilloscope

and adjust them as shown in the table.



A kanali V_{CE}	O'zgarmas tok manbaiga ulanish
Ostsillografning B kanali V_{IF}	1 V / bir O'zgarmas tok manbaiga ulanish
Vaqtga asoslangan ostsillograf va trigger	1 s / bir Trigger A
Potentiometr	Taqriban V_{IF}2V bo'lguncha sozlang.

3. Bir parcha qog'oz olib chekkasida 5mmli teshikchalar qiling.



Endi qog'ozni yorug'lik to'sig'I bo'ylab siljiting. Ostsillograf izlarini kuzating va ostsillogramma hosil qilinganda to'xtatish knopkasini bosing.
Virtual ostsillografdan ostsillograf izlarini pastdagi bo'shliqqa sichqoncha ko'zlangan joyni belgilamaguncha barmog'ingiz bilan sichqonchaning chap knopkasini bosgan holda tushiring, so'ngra knopkani qo'yib yuboring. Siz ushbu jarayonni takrorlashingiz va eng so'nggi ostsillogrammani tajribaning natijasi sifaida saqlab qolishingiz mumkin. Diod toki va kuchlanishi uchun ma'lumotlarni berilgan maydonga kiriting.

4. Kuzatib bo'lgan holatni tasvirlang:

Natija varaqasi Ismi_____

1.Tayanch sexemani to`g`ri tuzish

10. O`lchov

Ua = chiqish kuchlanish
Ue = kirish kuchlanishi
Ro = teskari bog`lanish qarshiligi
R1 = qo`shimcha qarshilik
V = operatsion kuchaytrgichning kuchayish koeffsenti.

2.1

2.2

2.3
Javob:_____

_____

2.4
Javob:_____

_____

_____

Formula : _____

<a`lo> : 85 – 100 ball; <yaxshi > : 70 – 84 ball:
<qaoniqarli > : 55- 69 ball; <qaoniqarsiz >: 55 balldan past

amaliy mashg'ulot
o`lchovlaring baholari

1.(maksimal ball 25)

Ball:_____

2.1 (Ua va v uchun 10 balldan, maksimal 20 ball)

Ball:_____

2.2 (Ua va v uchun 2 balldan , maksimal 20 ball)

Ball:_____

2.3(maksimal 15 ball)

Ball:_____

2.4 (javob 15 ball, formula 5 ball maksimal 20 ball)

Ball:_____

Jami Ball:_____

Imzo:_____

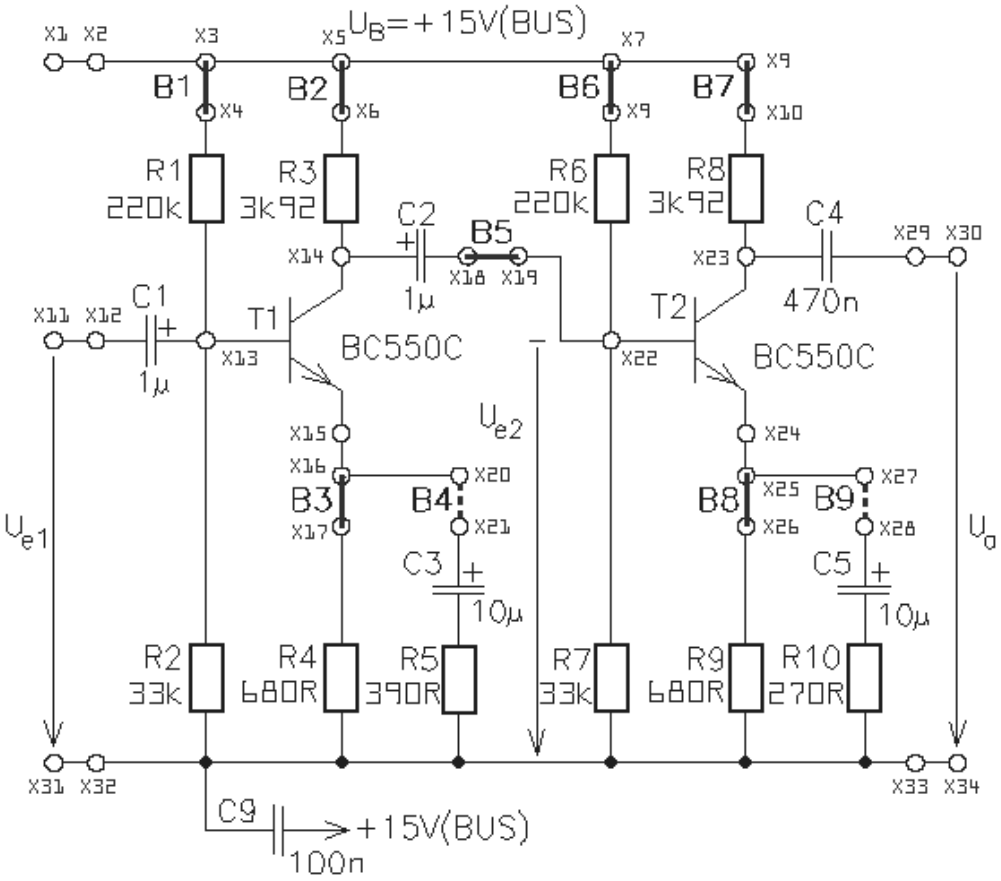
12 Amaliy mashgulot 2 soatga muljallangan

Sig’im ulanishli ikki kaskadli kuchaytirgich

Tranzistorli kuchaytirgichlar

Ushbu tajriba birinchi kaskadining chiqishi ikkinchisining kirishiga kondensator o’rqali bo’glangan ikki kaskadli kuchaytirgichning amaliyotini o’rganadi.

Tajriba o’rnatilishi;



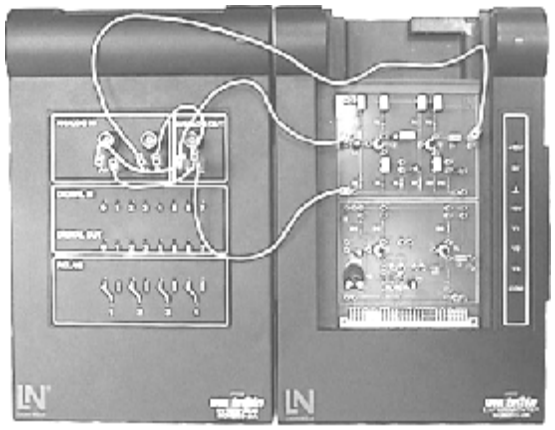
Tartibi

1. Experimentatorni UniTrain-I interfeysiga ulang va *SO4203-7N*.”Tranzistorli kuchaytirgichlar” tajriba platasini o’rnating.

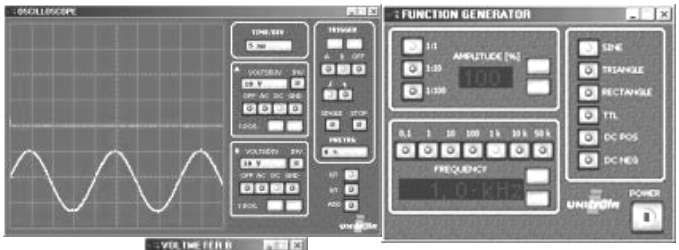
   Jamperlarni sxema diagrammasida ko’rsatilganidek to’g’ri chiziqlar bilan o’rnating platani UniTrain-I ning interfeysi bilan ulanishlar ro’yxatida ko’rstilgandek ulang

Ulanishlar ro’yxati

Dan	*Ga*
Interfeys S (ANALOG OUT)	*Terminal X11*
Interfeys ⊥(ANALOG OUT)	*Terminal X31*
Terminal X11	*Interfeys A+*
Interfeys ⊥(ANALOG OUT)	
Terminal X14	*Interfeys B+*
Jumperlar	



B1,B2,B3,B5,B6,B7,B8	
B1 Terminallar X3-X4	B2 Terminallar X5-X6
B3 Terminallar X16-X17	B5 Terminallar X18-X19
B6 Terminallar X7-X8	B7 Terminallar X9-X10
B8 Terminallar X25-X26	
Keyin foydalangan –boshida ulanmagan	
B4 Terminallar X20-X21	B9 Terminallar X27-X28



2. Har ehtimolga ko’ra ochgan hamma virtual uskunalarni yoping va Uskunalar menyusidan quyidagi virtual uskunalarni oching:
   - Funktsiya generatori,
   - A Voltmetri
   - B Voltmetri

   va ularni jadvalda ko’rsatilganidek sozlang. Tajriba kursida quyidagi uskunaning bo’lishi ham talab qilinadi
   - Ostsillogarf

   Buning o’rnatilishi ham jadvalda berilgan. Siz birinchisidan ikkinchisiga tezlikda qayta ulana olishingiz uchun bir ish maydonini voltmetrlar o’rnatilishlari uchun va yana bir ish maydonini ostsillograf o’rnatilishlari uchun saqlab turishni xohlashingiz mumkin.

O’rnatilishlar

Funktsiya generatori	Kuchlanish 1:100, 30% Chastota 1kGts Rejim sinus Tokka ulangan
A Voltmetri	Raqamli Diapazon 100mV Rejim O’zgaruvchan tok/ pp
B Voltmetri	Raqamli Diapazon 1-10V Rejim o’rnatilish / pp
Ostsillografning A kanali	20mV / bo’l O’zgaruvchan tokka ulanish, Qizil
Ostsillografning B kanali	1V / bo’l O’zgaruvchan tokka ulanish, Ko’k
Ostsillograf Vaqtga asoslangan va trigger	Rejim X/T 500µs / Bo’l Trigger O’chirilgan

3. Funktsiya generatoridan foydalanib, **60 mV** ning **1kGts sinus to’lqin** signalini X11 va X31 terminallar o’rtasiga qo’llang (Funktsiya generatori 1:100 nisbatda 30% ga sozlanilishi kerak) **A virtual voltmetridan** foydalanib ushbu kirish kuchlanishini o’lchang. Bu kaskaddan chiqish **X22** terminalidan olingan va **B virtual voltmetrida** o’lchanishi mumkin. Ushbu nuqtadagi kuchlanishlarni o’ngdagi maydonlarga kiriting va ulardan kuchayishni hisoblab chiqing.

Kirish kuchlanishi V_{e1} _____ mV_{pp}

Chiqish kuchlanishi V_{a1} _____ mV_{pp}

Kuchayish _____

4. Endi shu jarayonni ikkinchi kaskad uchun takrorlang. **X22** dagi kirish kuchlanishini va **X29** dagi chiqish kuchlanishini o'lchang.

Kirish kuchlanishi V_{e2} ____ mV_{pp}

Chiqish kuchlanishi V_{a2} ____ mV_{pp}

Kuchayish ____

5. Butun bir sxema uchun kuchayishni hisoblashning ikki yo'lini ko'rsating.

6. Shu nuqtagacha ikkala kaskadning teskari aloqasi sof qarshilik orqali amalga oshirilgan edi..Endi biz qanday qilib bir yoki ikkala kaskadda sig'imli teskari aloqaning signallarga ta'sir qilishini ko'rib chiqamiz. Avvalo,yuqoridagi o'rnatilishlardan foydalanib **A kanalida** birinchi kaskaddagi(X11-X31)kirish (60 mVpp) ostsillogrammalarini va **B kanalida** ikkinchi kaskaddan(X29-X31) chiqish ostsillogrammalarini oling Bu ostsollogrammalarni pastdagi chap xonachaga, **A xonachaga** ko'chiring va siz allaqachon o'lchagan kuchlanish va kuchayish kattaliklarini yonidagi kataklarga kiriting. **B4** (**X20-X21**) va **B9** (**X27-X28**) jamperlari tegishli kaskadlarga sig'imli teskari aloqani qo'shish uchun o'rnatilishi mumkin**. B4** jamperi **C3** teskari aloqa kondensatorini birinchi kaskadga va **B9** jamperi **C5** teskari aloqa kondensatorini ikkinchi kaskadga qo'shadi. Ikkala lamperlarning har bir kombinatsiyasi uchun, yuqoridagidek kirish va chiqish kuchlanishlari va kuchayishni aniqlang va ularni kirish va chiqish ostsillogrammalari bilan pastdagi katakka kiriting (Sizda **B4** va **B9** lar qatnashmagan kombinatsiyalari allaqachon mavjud)

Voltmetrlar va ostsillograflar bir vaqtning o'zida ishlatilmasligi ma'lum. Har bir o'lchashdan oldin uskunalarni ochib yopmaslik va ularni yana sozlamaslik uchun, L@Bsoftning Ish maydonini saqlash imkoniyatiga ko'ra **Save Workspace(**Ish Maydonini Saqlash) rejimidan foydalanib, voltmetrlarning o'rnatilishlari va bitta ostsillografning sozlanishi bilan o'z ish maydoningizning o'zgartirishlarini saqlashingiz mumkin.

A:

B4 (C3) ☐

B9 (C5) ☐

V_{e1} ____

V_{e2} ____

V_{a2} ____

$Kuchayish_1$ ____

$Kuchayish_2$ ____

$Kuchayish_{um}$ ____

CHNA Div : ____

CHNB Div : ____

B:

B4 (C3) ☑

B9 (C5) ☐

V_{e1} ____

V_{e2} ____

V_{a2} ____

$Kuchayish_1$ ____

$Kuchayish_2$ ____

$Kuchayish_{um}$ ____

CHNA Div : ____

CHNB Div : ____

C:

B4 (C3) ☐

B9 (C5) ☑

V_{e1} ____

V_{e2} ____

V_{a2} ____

$Kuchayish_1$ ____

$Kuchayish_2$ ____

$Kuchayish_{um}$ ____

CHNA Div : ____

CHNB Div : ____

D:

B4 (C3) ☑

B9 (C5) ☑

V_{e1} ____

V_{e2} ____

V_{a2} ____

$Kuchayish_1$ ____

$Kuchayish_2$ ____

$Kuchayish_{um}$ ____

CHNA Div : ____

CHNB Div : ____

7. Qanday ravishda teskari aloqa kombinatsiyalari kuchaytirilgan signallarga ta'sir qiladi?

Natija varaqasi Ismi_____

1.Tayanch sexemani to`g`ri tuzish

11. O`lchov

Ua = chiqish kuchlanish
Ue = kirish kuchlanishi
Ro = teskari bog`lanish qarshiligi
R1 = qo`shimcha qarshilik
V = operatsion kuchaytrgichning kuchayish koeffsenti.

2.1

2.2

2.3
Javob:_____

_____

2.4
Javob:_____

_____

_____

Formula : _____

<a`lo> : 85 – 100 ball; <yaxshi > : 70 – 84 ball:
<qaoniqarli > : 55- 69 ball; <qaoniqarsiz >: 55 balldan past

amaliy mashg'ulot
o`lchovlaring baholari

1.(maksimal ball 25)

Ball:_____

2.1 (Ua va v uchun 10 balldan, maksimal 20 ball)

Ball:_____

2.2 (Ua va v uchun 2 balldan , maksimal 20 ball)

Ball:_____

2.3(maksimal 15 ball)

Ball:_____

2.4 (javob 15 ball, formula 5 ball maksimal 20 ball)

Ball:_____

Jami Ball:_____

Imzo:_____

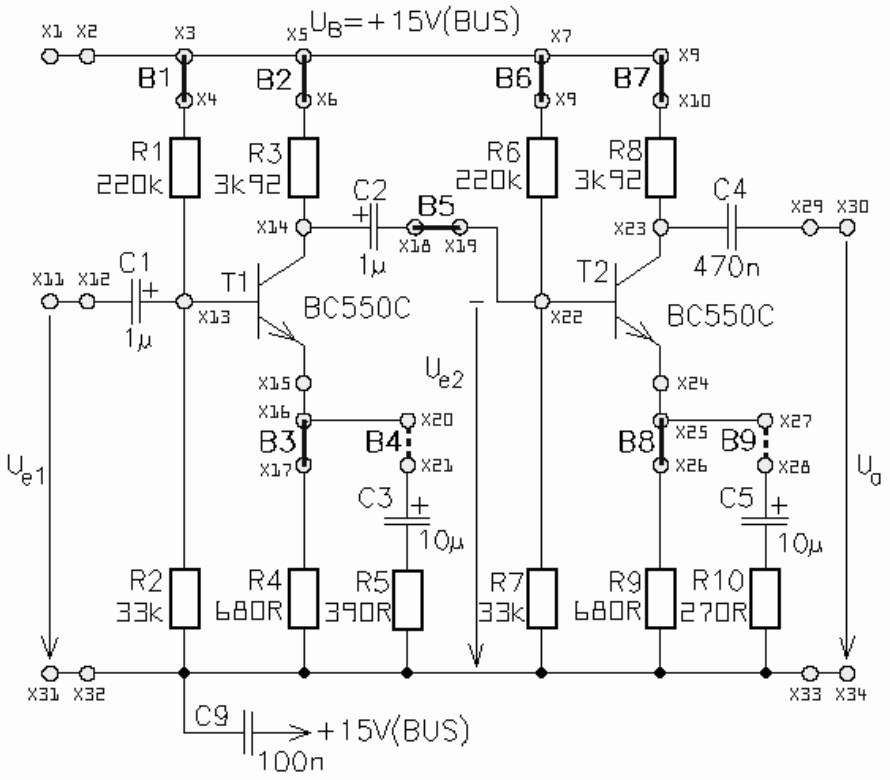
13 Amaliy mashgulot 2 soatga muljallangan

Sig’imli ulangan 2 kaskadli kuch-chning ch. reaktsiyasi

Tranzistorli kuchaytirgichlar

Sxema chastotaga bo’gliq bo’lib, chiqish kuchlanishi o’zining maksimum kattaligining 0.707 (1/ □2) darajasiga tushgan oraliqdagi chastotalarda hisoblab chiqilgan o’tkazish polosasiga ega. Bu tajriba oldingi tajribada tanishtirilgan ikki terskari aloqali sxema chastota reaktsiyalarini ko’rib chiqadi. Har bir holatda o’tkazish polosasi aniqlanadi. O’lchangan o’tkazish polosasi UniTrain-I ning analog kirishining kirish qarshiligi bilan qo’shimcha ravishda ta’sirlanishini e’tiborga oling. O’lchashlarning aniqligini kuchaytirgich sxemalarining ostsillogrammalari uchun odatiy bo’lgan 10:1 olchash namunasidan(tartib raqami. LM 9036) foydalanib yaxshilash mumkin. Bunday namunalar chastota reaktsiyalarining o’lchovida ayniqsa foydali.

Tajriba o’rnatilishi



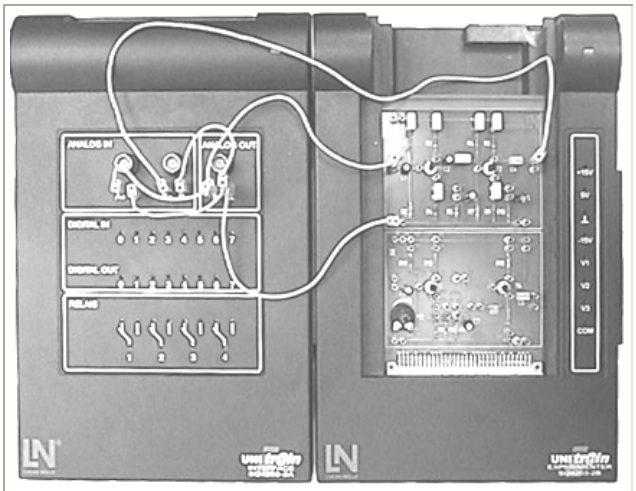
Tartibi

1. Experimentatorni UniTrain-I interfeysiga ulang va *SO4203-6A*.”Tranzistorning asosiy sxemalari” tajriba platasini o’rnating.

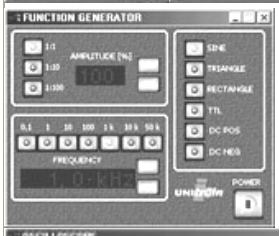
   Jamperlarni sxema diagrammasida ko’rsatilganidek to’g’ri chiziqlar bilan o’rnating platani UniTrain-I ning interfeysi bilan ulanishlar ro’yxatida ko’rstilgandek ulang

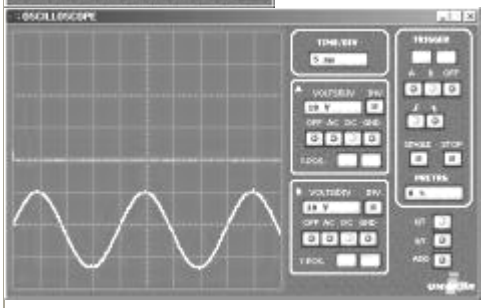
Ulanishlar ro’yxati

Dan	*Ga*
Interfeys S (ANALOG CHIQISH)	*Terminal X11*
Interface ⊥(ANALOG CHIQISH)	*Terminal X31*
Terminal X11	*IInterfeys A+*
Terminal X31	*Interfeys A-*
Terminal X14	*Interfeys B+*



Terminal X31	*Interfeys B-*
Jumperlar	
B1,B2,B3,B5,B6,B7,B8	
B1 Terminallar X3-X4	*B2 Terminallar X5-X6*
B3 Terminallar X16-X17	*B5 Terminallar X18-X19*
B6 Terminallar X7-X8	*B7 Terminallar X9-X10*
B8 Terminallar X25-X26	
Keyin foydalanilgan –boshida ulanmagan	





Har ehtimolga ko’ra ochgan hamma virtual uskunalarni yoping va Uskunalar menyusidan quyidagi virtual uskunalarni oching:
- Funktsiya generatori,
- Ostsillograf

va ularni jadvalda ko’rsatilganidek sozlang.

Tajriba kursida quyidagi uskunaning bo’lishi ham talab qilinadi:
- Voltmetr A
- Voltmetr B

O’rnatilishlar

Funktsiya generatori	Kuchlanish 1:100, 30% Chastota 1kGts Rejim SINUS Tokka ulangan
Ostsillografning A kanali	20mV / div O’zgaruvchan tokka ulanish, Qizil
Ostsillografning B kanali	2V / bo’l O’zgaruvchan tokka ulanish, Ko’k
Vaqtga asoslangan ostsillograf va trigger	Rejim X/T 500 µs / bo’l Trigger O’chirilgan
A Voltmetri	Raqamli Diapazon 100mV Rejim AC / Vpp
B Voltmetri	Raqamli Diapazon 1V Rejim O’zgaruvchan Tok / Vpp

Bular uchun ham o’rnatilishlar jadvalda berilgan.
Siz birinchisidan ikkinchisiga tezlikda qayta ulana olishingiz uchun bir ish maydonini voltmetrlar o’rnatilishlari uchun va yana bir ish maydonini ostsillograf o’rnatilishlari uchun saqlab turishni xohlashingiz mumkin.

3. Chastota generatorini **X11** va **X31** o’rtasidagi kirishga **1kGts sinus to’lqin** signali hosil qilish uchun o’rnating. 60 mVpp dan boshlab amplitudani yuqoriga ko’taring va **X29** va **X31** o’rtasidagi chiqish signali qayerda chetlashishni boshlashini aniqlash uchun ostsillografdan foydalaning. So’ngra ostsillografni yoping va shu nuqtadagi chiqishning eng yuqori nuqtadan eng yuqori nuqtaga bo’lgan kattaligini o’lchash uchun voltmetrlarni oching.

Kirish kuchlanishi V_e ____
Chiqish kuchlanishi V_a ____
Kuchayish ____

4. Kirishning amplitudasini o’shandek saqlab qolgan holda, pastdagi jadvalda ko’rsatilgan chastotalardagi chiqish amplitudasini o’lchang. Tugatganingizda jadvalni diagramma rejimiga qayta ulang va bu logarifmik shkaladagi chastota reaktsiyasining grafigini ko’rsatadi.

Jadval 1

5. Chiqishning maksimal amplitudasi bo’lgan **0.7071** (1/√2) sonini hisoblab chiqing. Qaysi chastotalarda chiqish bu kattaliklarga ega bo’lishini chastota reaktsiyasi grafigidan aniqlang yoki voltmetrlardan foydalanib o’lchang. Olgan ikki javobingizdan o’tkazish polosasini hisoblab chiqing.

0.7071 x Maks.amplituda = ____
Past chastota f_1 = ____
Yuqori chastota f_2 = ____
O’tkazish polosasi b = ____

6. Endi sxemaga si’gimli teskari aloqaniqo’shish uchun **B4** va **B9** jamperlarini qo’shish orqali

Kirish kuchlanishi V_e ____
Chiqish kuchlanishi V_a ____

sxemani o’zgartiring. Funktsiya generatorini **1 kGts sinus to’lqin** hosil qilish uchun o’rnating va maksimum chetlashmagan chiqishga erishish uchun amplitudani moslang**.** Kuchaytirgichning kirish va chiqish kuchlanishlarini o’lchang va kattaliklarni o’ngdagi katakka kiriting. Ushbu kattaliklardan uning kuchayishini hisoblab chiqing.	Kuchayish

7. Pastdagi jadvalda ko’rsatilgan chastotalardagi chiqish amplitudasini o’lchang Tugatganingizda jadvalni diagramma rejimiga qayta ulang va bu logarifmik shkaladagi chastota reaktsiyasining grafigini ko’rsatadi.

Jadval 2

8. Chiqishning maksimal amplitudasi bo’lgan **0.7071** sonini hisoblab chiqing. Qaysi chastotalarda chiqish bu kattaliklarga ega bo’lishini chastota reaktsiyasi grafigidan aniqlang yoki voltmetrlardan foydalanib o’lchang Olgan ikki javobingizdan o’tkazish polosasini hisoblab chiqing	0.7071 x Maks.amplituda = Past chastota f_1 = Yuqori chastota f_2 = O’tkazish polosasi b =

9. Sig’imli ulangan ikki kaskadli kuchaytirgichning ba’zo mumkin bo’lgan afzalliklari va kamchiliklarini keltiring.

Afzallilklari:

Kamchiliklari:

Qo’llanilishi:

Qo’shimcha

10. Agar yuqoridagi tajribalar uchun siz 10:1 o’lchash namunasidan foydalanmagan bo’lsangiz, lekin sizda o’sha qurilma uchun ruxsat bo’lgan taqdirda bu o’lchovlarni bajarganingizda o’tkazish polosasi uchun qanday natijalarga ega bo’lasiz?

Natija varaqasi Ismi_____

1.Tayanch sexemani to`g`ri tuzish

12. O`lchov

Ua = chiqish kuchlanish
Ue = kirish kuchlanishi
Ro = teskari bog`lanish qarshiligi
R1 = qo`shimcha qarshilik
V = operatsion kuchaytrgichning kuchayish koeffsenti.

2.1

2.2

2.3
Javob:_____

_____

2.4
Javob:_____

_____

_____

Formula : _____

<a`lo> : 85 – 100 ball; <yaxshi > : 70 – 84 ball:
<qaoniqarli > : 55- 69 ball; <qaoniqarsiz >: 55 balldan past

amaliy mashg'ulot
o`lchovlaring baholari

1.(maksimal ball 25)

Ball:_____

2.1 (Ua va v uchun 10 balldan, maksimal 20 ball)

Ball:_____

2.2 (Ua va v uchun 2 balldan , maksimal 20 ball)

Ball:_____

2.3(maksimal 15 ball)

Ball:_____

2.4 (javob 15 ball, formula 5 ball maksimal 20 ball)

Ball:_____

Jami Ball:_____

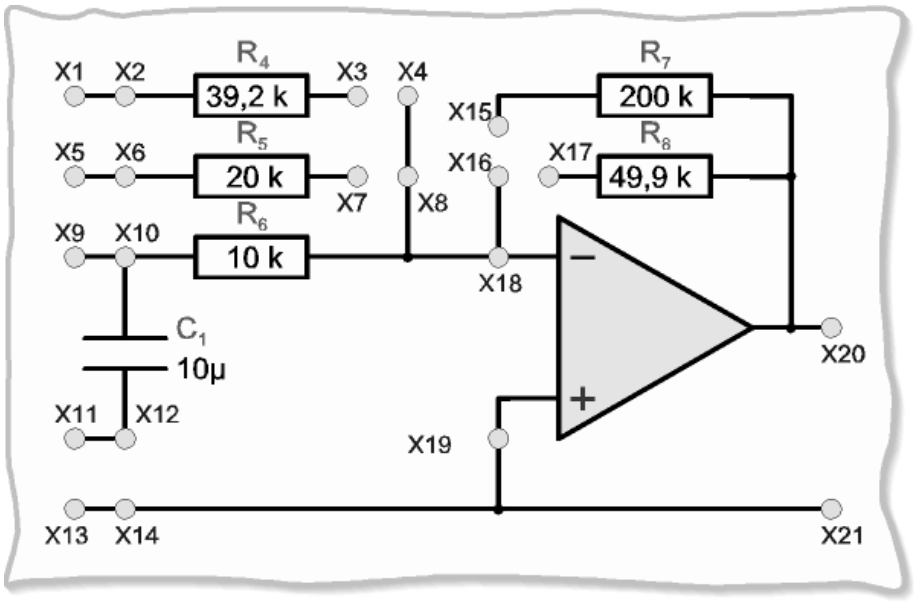
Imzo:_____

14 Amaliy mashgulot 2 soatga muljallangan

DC sxemalaridagi inverslashtiruvchi operatsion kuchaytirgichlar

Ushbu tajriba inverslashtiruvchi kuchaytirgichlardagi kirish va chiqish nisbatlarini namoyish qiladi. Kuchayishni hisoblash formulasi tajribalar yo'li bilan ib chiqariladi va tasdiqlanadi. Boshlanishida kirish kuchlanishi, keyin teskari aloqa qarshiligi, nihoyat kirish qarshiligi o'zgrtiriladi. Har bir holatda chiqish kuchlanishidagi effekt o`lchanadi.

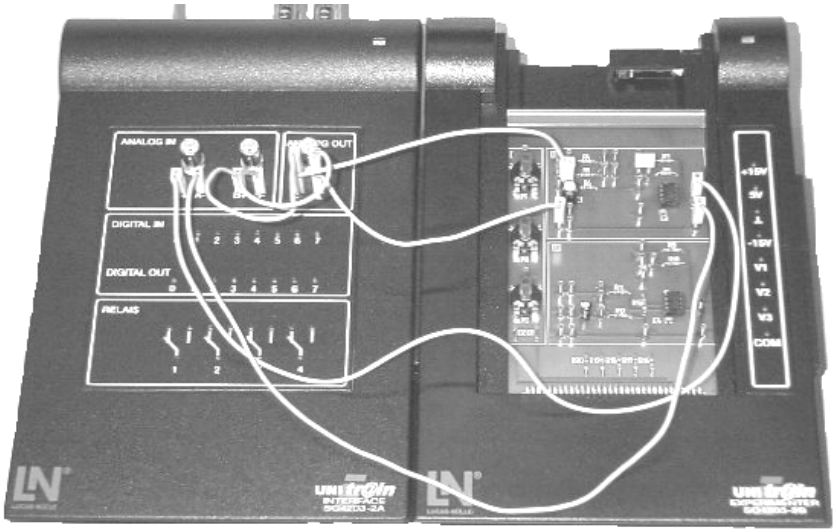
Sxema



Tartibi

1. Experimentatorni UniTrain-I interfeysiga ulang va *SO4203-7W*."Operatsion kuchaytirgichlar" tajriba platasini o'rnating.

   Platani UniTrain-I ning inerfeysiga sxema diagrammasida va ulanishlar ro'yxatida ko'rstilgandek ulang:

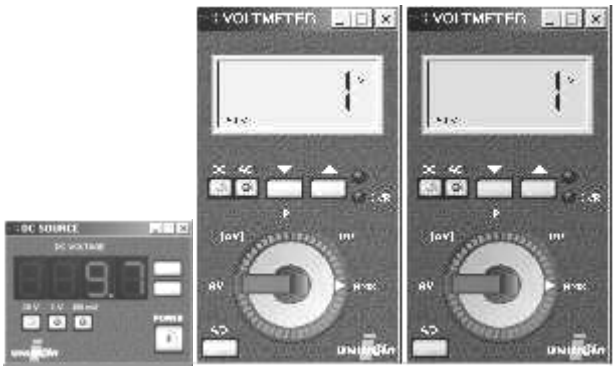


R_6 va **R_8** rezistorli inverslashtiruvchi kuchaytirgichlar

Ulanishlar ro'yxati

Dan	*Ga*
Interfeys S	Terminal X9
Interfeys Yer	Terminal X13
Interfeys S	Interfeys B+
Interfeys Yeri	Interfeys B-
Interfeys A+	Terminal X20
Interfeys A-	Terminal X21
Terminal X16	Terminal X17

2. Uskunalar menyusidan quyidagi virtual uskunalarni oching:
   - O'zgarmas tok manbai,
   - A Voltmetri
   - B Voltmetri
   va ularni jadvalda ko'rsatilganidek sozlang.



O'rnatilishlar

O'zgarmas tok manbai	Tokka ulangan, Amplitudani B voltmetr 0.5V ni o'qigunga qadar ko'paytiring
A Voltmetri V_A	Raqamli Diapazon 10V O'zgarmas tok va O'zgaruvchan kuchlanish
B Voltmetri V_E	Raqamli Diapazon 2V O'zgarmas tok va O'zgaruvchan kuchlanish

3. Chiqish kuchlanishlarini o'lchang va tegishli maydonga kiriting.

1- natija

_____ V

Chiqish kuchlanishi

4. Sxemaning kuchayishini aniqlang:
   Kuchayish = V_A / V_E

2- natija

Kuchayish

_____

5. V_E kirish kuchlanishini 1V.ga o'rnating
   Chiqish kuchlanishini o'lchang va tegishli maydonga kiriting.

3- natija

_____ V

Chiqish kuchlanishi

6. Sxemaning kuchayishini aniqlang:
   Kuchayish = V_A / V_E

4- natija

Kuchayish

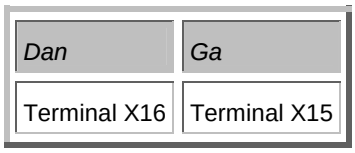
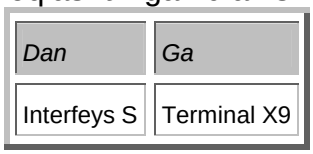
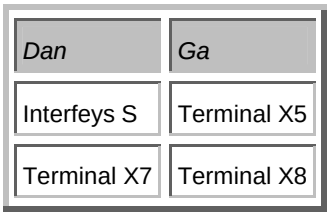
_____

7. 2 va 4 natijalarni solishtiring
Nimani kuzatmoqdasiz? Kirish kuchlanishi o'zgarganda kuchayish qanday o'zgaradi?

8. O'zgarmas tok manbaini o'chiring.
   Teskari aloqa rezistorini R_8=49.9 kOm dan R_7=200 kOm.ga o'zgartiring.

Uzoqlashtirilgan ulanishlar

Dan	*Ga*
Terminal X16	Terminal X17

	Yangi ulanishlar 
9. Kirish kuchlanishini V_E = 0.5V ga o'rnating va chiqish kuchlanishini o'lchang.	5- natija V Chiqish kuchlanishi
10. Sxemaning kuchayishini aniqlang: Kuchayish = V_A / V_E	6- natija Kuchayish
11. 2 va 6 natijalarni solishtiring. Nimani kuzatmoqdasiz? Teskari aloqa rezistori va kuchayish o'rtasidagi nisbat qanday?	
12. O'zgarmas tok manbaini o'chiring Kirish rezistorini R_6=10 kOmdan to R_5=20 kOm ga o'zgartiring.	Uzoqlashtirilgan ulanishlar  Yangi ulanishlar 
13. Kirish kuchlanishini V_E = 0.5V ga o'rnating va chiqish kuchlanishini o'lchang.	7- natija V Chiqish kuchlanishi
14. Sxemaning kuchayishi aniqlang: Kuchayish = V_A / V_E	8- natija Kuchayish
15. 6 va 8 natijalarni solishtiring. Nimani kuzatmoqdasiz? Kirish qarshiligi va kuchayish o'rtasidagi nisbat qanday?	

Natija varaqasi Ismi_____

1.Tayanch sexemani to`g`ri tuzish

13. O`lchov

Ua = chiqish kuchlanish
Ue = kirish kuchlanishi
Ro = teskari bog`lanish qarshiligi
R1 = qo`shimcha qarshilik
V = operatsion kuchaytrgichning kuchayish koeffsenti.

2.1

2.2

2.3
Javob:_____

_____

2.4
Javob:_____

_____

_____

Formula : _____

<a`lo> : 85 – 100 ball; <yaxshi > : 70 – 84 ball:
<qaoniqarli > : 55- 69 ball; <qaoniqarsiz >: 55 balldan past

amaliy mashg'ulot
o`lchovlaring baholari

1.(maksimal ball 25)

Ball:_____

2.1 (Ua va v uchun 10 balldan, maksimal 20 ball)

Ball:_____

2.2 (Ua va v uchun 2 balldan , maksimal 20 ball)

Ball:_____

2.3(maksimal 15 ball)

Ball:_____

2.4 (javob 15 ball, formula 5 ball maksimal 20 ball)

Ball:_____

Jami Ball:_____

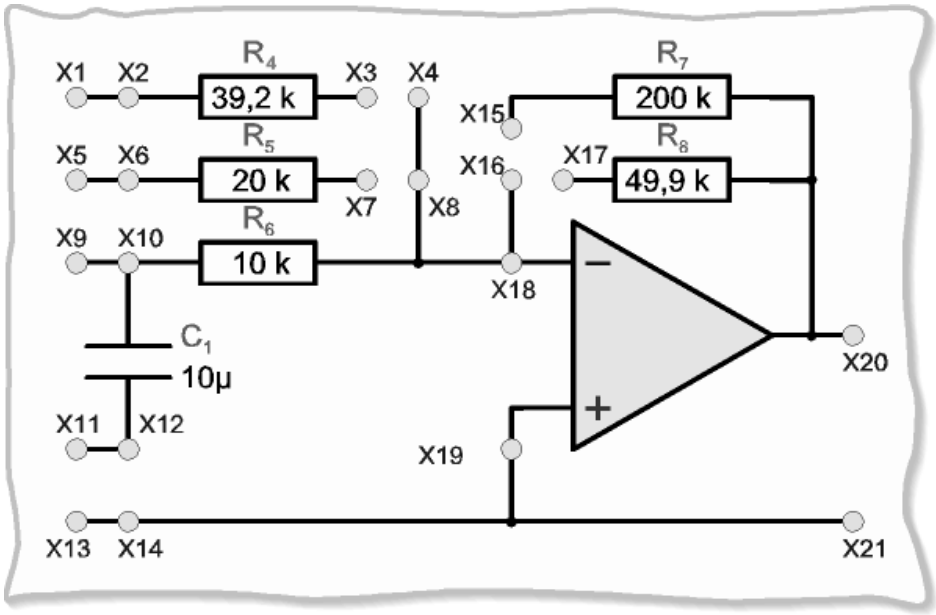
Imzo:_____

15 Amaliy mashgulot 2 soatga muljallangan

AC sxemalaridagi inverslashtiruvchi operatsion kuchaytirgichlar

Ushbu tajriba O'zgaruvchan tok sxemalaridagi operatsion kuchaytirgichlar kirish va chiqishn kuchlanishlari o'rtasidagi munosabatni ko'rsatadi. O'lchashlar kuchayishning qanday ravishda kirish chastotasiga bo'gliqligini ko'rsatish uchun qilinadi.

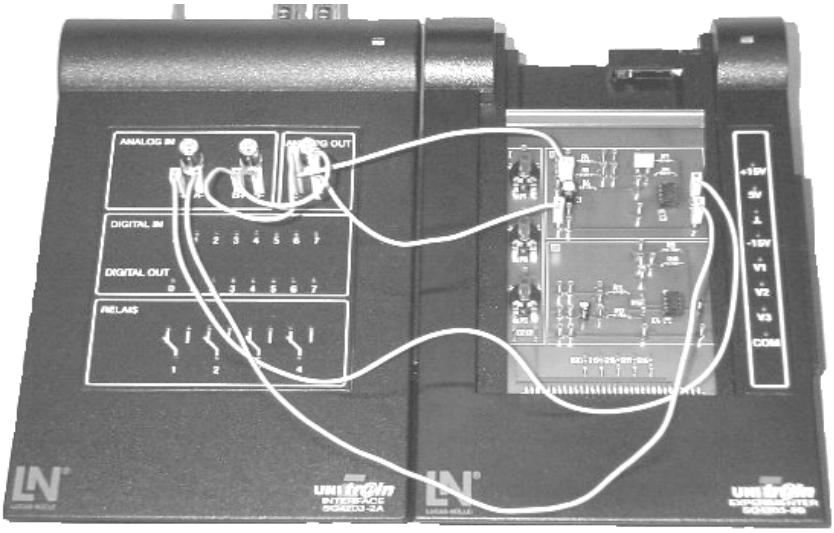
Sxema



Tartibi

1. Experimentatorni UniTrain-I interfeysiga ulang va *SO4203-7W*."Operatsion kuchaytirgichlar" tajriba platasini o'rnating.

   Platani UniTrain-I ning inerfeysiga sxema diagrammasida va ulanishlar ro'yxatida ko'rstilgandek ulang:

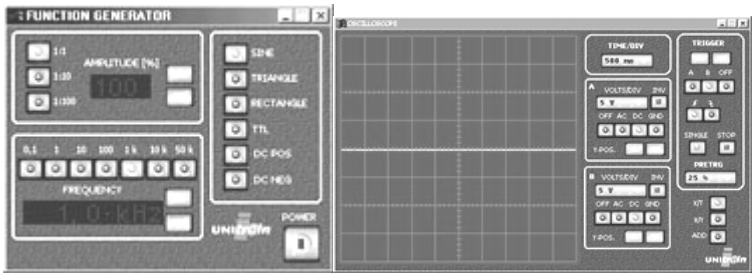


R_6 va **R_8** rezistorli inverslashtiruvchi kuchaytirgichlar

Ulanishlar ro'yxati

Dan	*Ga*
Interface S	Terminal X9
Interfeys Yeri	Terminal X13
Interface S	Interface B+
Interfeys Yeri	Interface B-
Interface A+	Terminal X20
Interface A-	Terminal X21
Terminal X16	Terminal X17

2. Uskunalar menyusidan quyidagi virtual uskunalarni oching:
   - Funktsiya generatori,
   - Ostsillograf
   - va ularni jadvalda ko'rsatilganidek sozlang.



O'rnatilishlar

Funktsiya generatori	Tokka ulangan, Amplituda 100% 1:10 da Chastota 100 Gts Sinus
Ostsillografning A kanali V_A	2V / bir O'zgarmas tokka ulanish
Ostsillografning B kanali V_E	500mV / bir O'zgarmas tokka ulanish
Vaqt asosidagi ostsillograf trigger	Rejim X/T 2ms / bir Trigger B

3. V_e kirish kuchlanishini va V_a chiqish kuchlanishini ostsillograf bilan o'lchang va izlarni qoshma maydonga ko'chiring. Shuningdek ostsillograf o'rnatilishlarini ham kiriting.

:

:

:

V_e : V_{pp}

f_e : Hz

V_a : V_{pp}

ulanish:

4. Jadvaldagi kattaliklarga ko'ra chastotani o'zgartiring va chiqishning tegishli eng yuqori nuqtadan eng yuqori nuqtasiga bo'lgan kattaligiga(amplituda) kiriting. Hamma kattaliklarni qayd qilib bo'lganingizdan so'ng jadvalni diagramma rejimiga qayta ulang.

5. Funktsiya grafigining shaklini qanday talqin qilasiz?
Qaysi chastotadan yuqorida chiqish zaiflashadi yoki chetlashadi? Buni "O'zgarmas tok manbai sxemalaridagi inverslashtiruvchi operatsion kuchaytirgichlar" tajribasi natijalari bilan solishtiring. Nimani kuzatmoqdasiz?

Natija varaqasi Ismi_____

1.Tayanch sexemani to`g`ri tuzish

14. O`lchov

Ua = chiqish kuchlanish
Ue = kirish kuchlanishi
Ro = teskari bog`lanish qarshiligi
R1 = qo`shimcha qarshilik
V = operatsion kuchaytrgichning kuchayish koeffsenti.

2.1

2.2

2.3
Javob:_____

_____

2.4
Javob:_____

_____

_____

Formula : _____

<a`lo> : 85 – 100 ball; <yaxshi > : 70 – 84 ball:
<qaoniqarli > : 55- 69 ball; <qaoniqarsiz >: 55 balldan past

amaliy mashg'ulot
o`lchovlaring baholari

1.(maksimal ball 25)

Ball:_____

2.1 (Ua va v uchun 10 balldan, maksimal 20 ball)

Ball:_____

2.2 (Ua va v uchun 2 balldan , maksimal 20 ball)

Ball:_____

2.3(maksimal 15 ball)

Ball:_____

2.4 (javob 15 ball, formula 5 ball maksimal 20 ball)

Ball:_____

Jami Ball:_____

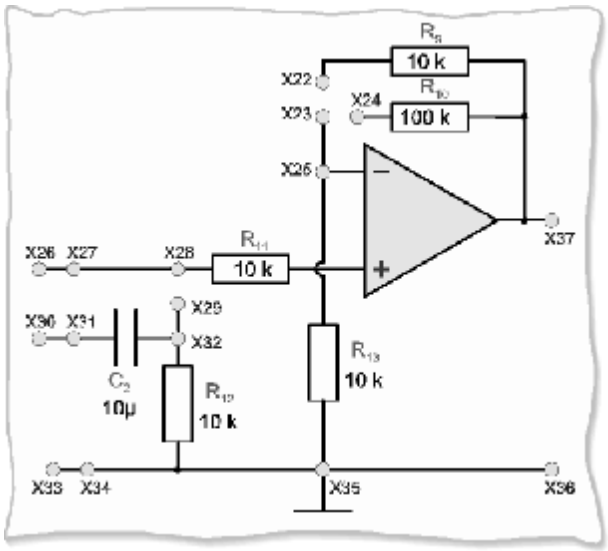
Imzo:_____

16 Amaliy mashgulot 2 soatga muljallangan

DC sxemasidagi inverslashtirmaydigan operatsion kuchaytirgichlar

Ushbu tajriba **inverslashtirmaydigan kuchaytirgichlardagi** kirish va chiqish munosabatlarini namoyish qiladi.Kuchayishni hisoblash formulasi tajribalar yo'li bilan ib chiqariladi va tasdiqlanadi. Boshlanishida kirish kuchlanishi, keyin teskari aloqa qarshiligi, nihoyat kirish qarshiligi o'zgartiriladi. Har bir holatda chiqish kuchlanishidagi effekt o'lchanadi.

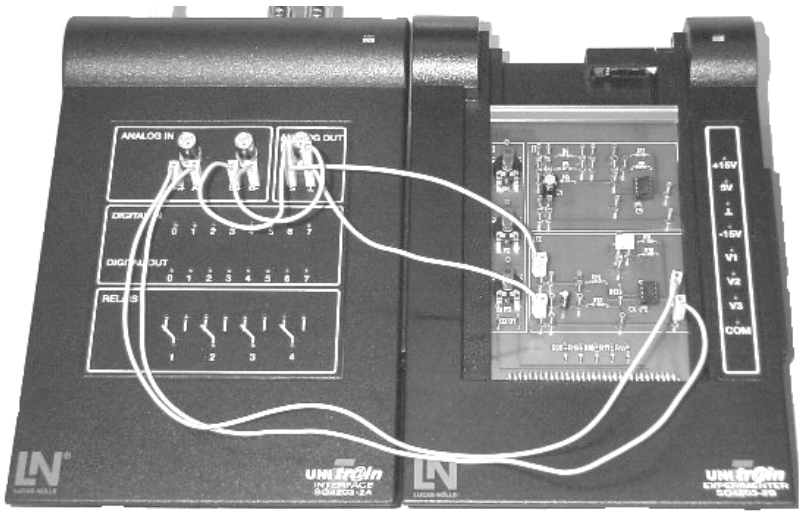
Sxema



Tartibi

1. Experimentatorni UniTrain-I interfeysiga ulang va *SO4203-7W.*"Operatsion kuchaytirgichlar" tajriba platasini o'rnating.

   Platani UniTrain-I ning inerfeysiga sxema diagrammasida va ulanishlar ro'yxatida ko'rstilgandek ulang



Ulanishlar ro'yxati

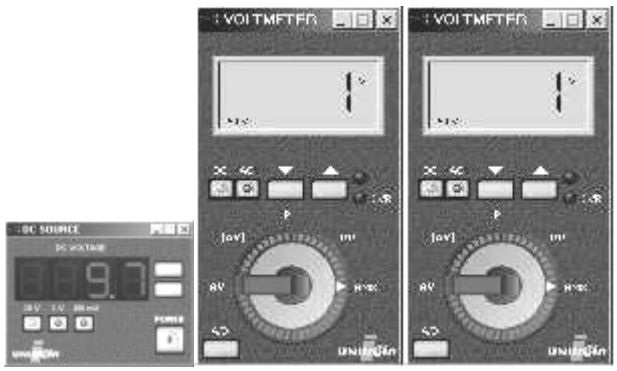
Dan	*Ga*
Interfeys S	Terminal X26
Interfeys Yer	Terminal X33
Interfeys S	Interface B+
Interfeys Yer	Interfeys B-
Interfeys A+	Terminal X37
Interfeys A-	Terminal X36
Terminal X23	Terminal X24

2. Uskunalar menyusidan quyidagi virtual uskunalarni oching:
   - O'zgarmas tok manbai,
   - A Voltmetri
   - B Voltmetri

O'rnatilishlar

O'zgarmas tok	Tokka ulangan,

va ularni jadvalda ko’rsatilganidek sozlang.



manbai	Amplitudani B voltmetr 0.5V ni o’qigunga qadar ko’paytiring
A Voltmetri V_A	Raqamli Diapazon 10V O’zgarmas tok va O’zgaruvchan kuchlanish
B Voltmetri V_E	Digital Diapazon 2V O’zgarmas tok va O’zgaruvchan kuchlanish

3. Chiqish kuchlanishini o’lchang va uni tegishli maydonga kiriting.

Natija 1

V

Chiqish kuchlanishi

4. Sxemaning kuchayishini aniqlang:
Kuchayish = V_A / V_E

Natija 2

Kuchayish

5. V_E kirish kuchlanishini 1V.ga o’rnating
Chiqish kuchlanishini o’lchang va uni tegishli maydonga kiriting.

Natija 3

V

Chiqish kuchlanishi

6. Sxema kuchayishini aniqlang:
Kuchayish = V_A / V_E

Natija 4

Kuchayish

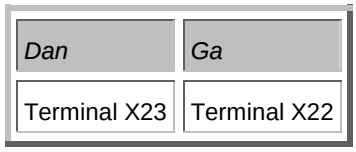
7. 2 va 4.natijalarni solishtiring
Nimani kuzatmoqdasiz?Kirish kuchlanishi o’zgarganda kuchayish qanday o’zgaradi?

8. O’zgarmas tok manbaini o’chiring.
Teskari aloqa rezistorini R_{10}=100 kOm R_9= 10 kOm ga o’zgartiring.

Uzoqlashtirilgan ulanishlar

Dan	*Ga*
Terminal X23	Terminal X24

Yangi ulanishlar

	
9. Kirish kuchlanishini V_E = 0.5V ga o'rnating va chiqish kuchlanishini o'lchang.	Natija 5 V Chiqish kuchlanishi
10. Sxemaning kuchayishini aniqlang: Kuchayish = V_A / V_E	Natija 6 Kuchayish
11. 2 va 6 natijalarni aniqlang. Nimani kuzatmoqdasiz? Teskari aloqa qarshiligi va kuchayish o'rtasidagi munosabat qanday?	

Natija varaqasi Ismi_____

1.Tayanch sexemani to`g`ri tuzish

15. O`lchov

Ua = chiqish kuchlanish
Ue = kirish kuchlanishi
Ro = teskari bog`lanish qarshiligi
R1 = qo`shimcha qarshilik
V = operatsion kuchaytrgichning kuchayish koeffsenti.

2.1

2.2

2.3
Javob:_____

_____

2.4
Javob:_____

_____

_____

Formula : _____

<a`lo> : 85 – 100 ball; <yaxshi > : 70 – 84 ball:
<qaoniqarli > : 55- 69 ball; <qaoniqarsiz >: 55 balldan past

amaliy mashg'ulot
o`lchovlaring baholari

1.(maksimal ball 25)

Ball:_____

2.1 (Ua va v uchun 10 balldan, maksimal 20 ball)

Ball:_____

2.2 (Ua va v uchun 2 balldan , maksimal 20 ball)

Ball:_____

2.3(maksimal 15 ball)

Ball:_____

2.4 (javob 15 ball, formula 5 ball maksimal 20 ball)

Ball:_____

Jami Ball:_____

Imzo:_____

ASOSIY ADABIYOTLAR

1. **Электроника и микропроцессорная техника, авторы Гусев В.Г., Гусев Ю.М., издательство М.: Высшая школа, 2005 год.**
2. **Отечественные полупроводниковые приборы: вып. 59/А.Аксенов, А.Нефедов - изд. 5-е доп. и испр. - 2005, М.: СОЛОН-Пресс - (Ремонт). - ISBN 5-98003-185-5**
3. **Схемотехника электронных систем. Аналоговые и импульсные устройства. В.И. Бойко. - 2004, СПб.: БХВ - Петербург - ISBN 5-94157-434-7**

QO'SHIMCHA ADABIYOTLAR

1. **Авторские материалы – Белецкий А.С. , Валиев И.И.**
2. **DVD издание "Супер ДВД библиотека" 2004 г**
3. **Интернет сайт www.tula.ru Раздел электроника**
4. **Интернет портал –Интернет университет www.intuit.ru**

5.Интернет сайт www.dvo.sut.ru