11 - AMALIY MASHG‘ULOT.
KIRXGOFNING IKKINCHI QONUNI VA UNGA DOIR MASALALAR ECHISH

Mashg‘ulotning maqsadi: Talabalarga Kirxgofning ikkinchi konuni va unga oid ma’lumotlarni berish, hamda bilim va ko‘nikmalarni masalalar yordamida shakllantirishdan iborat.

Mashg‘ulotning rejasi: 1. Nazariy qism.
2. Amaliy mashg‘ulotga doir namunaviy masalalar echish.
3. Amaliy mashg‘ulotni bajarishga oid mustaqil variantlar.
4. Nazorat savollari.

Tayanch so‘zlar va iboralar: tarmoqlangan elektr zanjir, tugun, yopiq kontur, tarmoq, zanjir, tok kuchi, qarshilik, EYUK.

1. Nazariy qism.

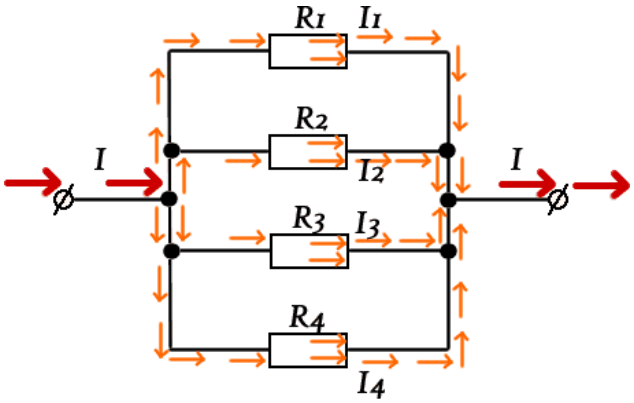
Gustav Robert Kirxgof. Nemis fizigi Gustav Robert Kirxgoff 1824 yil Kenigsbergda advokat oilasida tug‘ilgan. U 18 yoshida Kenigsberg universiteti o‘qishga kirdi va keyinchalik Berlinda ma’ruzachi bo‘ldi.

Kirxgoff 1847 yilda ikkita qonunni kashf qildi. Kirxgoff tarmoqlangan elektr zanjiri uchun o‘z qonunlarini tadbiq etgan. Kirxgoffning qonun-lari Om qonuni bilan birga, elektron nazariyasi asosini tashkil etdi. SHunday qilib, Kirxgoff dunyo muhandislari, kimyogarlar va fiziklari orasida mashhur bo‘ldi.

Taniqli olim va kashfiyotchi - Gustav Robert Kirxgoff 1887 yil vafot etgan.

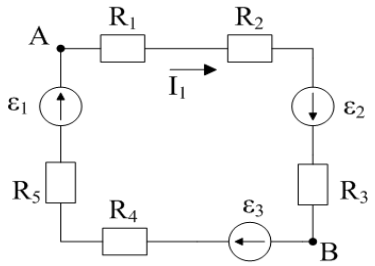
Tarmoqlangan elektr zanjiri uchun Kirxgofning II chi qonuni: tarmoqlangan zanjirning ixtiyoriy yopiq konturi qismlaridagi toklarning mos ravishda shu konturlar qarshiliklarga ko‘paytmalarining algebraik yig‘indisi konturdagi barcha EYUK larning algebraik yig‘indisiga teng:

$$\sum_{i=1}^{n} I_i R_i = \sum_{i=1}^{m} \varepsilon_i \ .$$



2. Amaliy mashg‘ulotga doir namunaviy masalalar echish.

11.1-masala. Zanjirning berk konturida R_1=2 Om; R_2=5 Om; R_3=8 Om; R_4=3 Om; R_5=4 Om li qarshiliklar ulangan bo‘lib, ularning EYUK lari ε_2=50 V va ε_3=10 V ga tengdir, hamda zanjirdan oqayotgan tok I_1=5 A bo‘lsa, zanjirning ε_1 EYUK aniqlansin.



Echish: Masalaning boshlang‘ich berilgan ma’lumoti va keltirilgan elektr sxema asosida, shuning bilan birga Kirxgofning ikkinchi qonuniga amal qilgan holda zanjirning ε_1 EYUK aniqlaymiz, ya’ni:

$$I_1 \cdot (R_1 + R_2 + R_3 + R_4 + R_5) = \varepsilon_1 + \varepsilon_2 + \varepsilon_3$$

$$5 \cdot (2+5+8+3+4) = \varepsilon_1 + 50 + 10$$

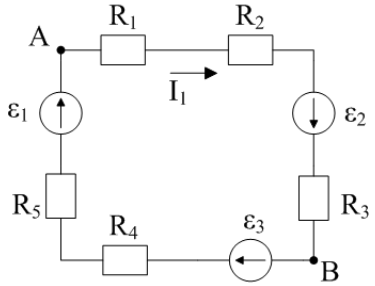
$$5 \cdot 22 = \varepsilon_1 + 60$$

$$110 - 60 = \varepsilon_1$$

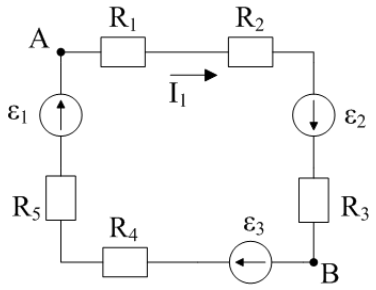
$$\varepsilon_1 = 50 \text{ (V)} \qquad \text{ga teng.}$$

3. Amaliy mashg‘ulotni bajarishga oid mustaqil variantlar.

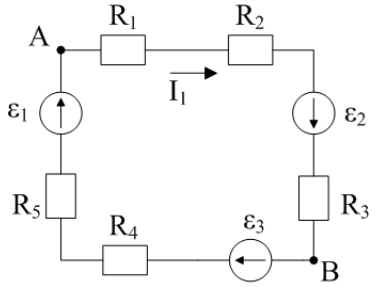
11.2-masala. Zanjirning berk konturida R_1=5 Om; R_2=8 Om; R_3=10 Om; R_4=15 Om; R_5=2 Om li qarshiliklar ulangan bo‘lib, ularning EYUK lari ε_1=40 V va ε_3=20 V ga tengdir, hamda zanjirdan oqayotgan tok I_1=2 A bo‘lsa, zanjirning ε_2 EYUK aniqlansin.



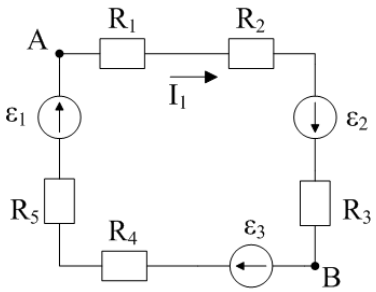
11.3-masala. Zanjirning berk konturida R_1=3 Om; R_2=4 Om; R_3=3,5 Om; R_4=6,5 Om; R_5=7,5 Om li qarshiliklar ulangan bo‘lib, ularning EYUK lari ε_1=50 V va ε_2=10 V ga tengdir, hamda zanjirdan oqayotgan tok I_1=2,5 A bo‘lsa, zanjirning ε_3 EYUK aniqlansin.



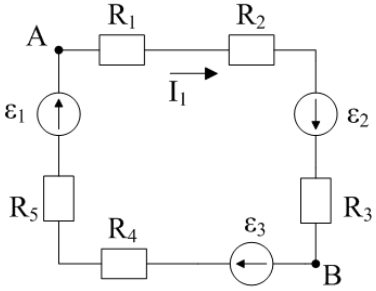
11.4-masala. Zanjirning berk konturida R_1=10 Om; R_2=9,5 Om; R_3=3,5 Om; R_4=2,5 Om; R_5=8,5 Om li qarshiliklar ulangan bo‘lib, ularning EYUK lari ε_1=65 V; ε_2=15 V; ε_3=10 V ga tengdir. Zanjirdan oqayotgan tok I_1 aniqlansin.



11.5-masala. Zanjirning berk konturida R_1=3,5 Om; R_2=7,5 Om; R_3=8,5 Om; R_4=1 Om li qarshiliklar ulangan bo‘lib, ularning EYUK lari ε_1=35 V; ε_2=10 V; ε_3=8 V ni tashkil etadi, hamda zanjirdan oqayotgan tok I_1=5,5 A bo‘lsa, zanjirning R_5 qarshiligi aniqlansin.

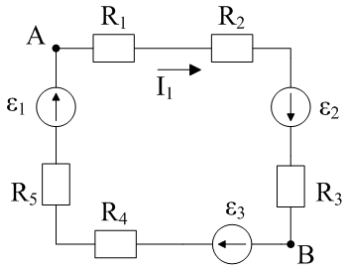


11.6-masala. Zanjirning berk konturida R_1=2 Om va R_5=8 Om li qarshiliklar ulangan bo‘lib, ularning EYUK lari ε_1=40 V; ε_2=50 V; ε_3=8 V ni tashkil etadi, hamda zanjirdan oqayotgan tok I_1=6 A bo‘lsa, zanjirning R_4 qarshiligi aniqlansin.

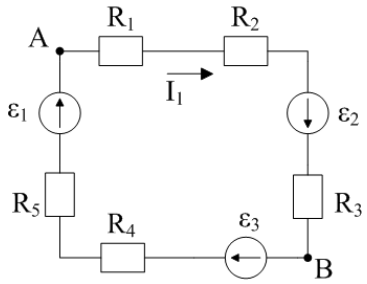


11.7-masala. Zanjirning berk konturida R_4=15 Om va R_5=10 Om li qarshiliklar ulangan bo‘lib, ularning EYUK lari ε_1=30 V; ε_2=20 V; ε_3=10 V ni

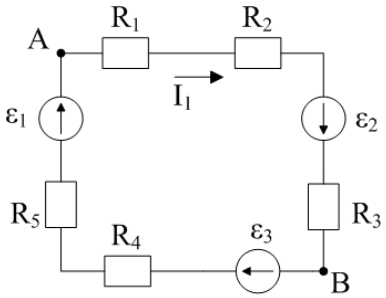
tashkil etadi, hamda zanjirdan oqayotgan tok I_1=7 A bo‘lsa, zanjirning R_3 qarshiligi aniqlansin.



11.8-masala. Zanjirning berk konturida R_1=3 Om; R_3=7 Om va R_4=15 Om li qarshiliklar ulangan bo‘lib, ularning EYUK lari ε_1=35 V; ε_2=25 V; ε_3=15 V ni tashkil etadi, hamda zanjirdan oqayotgan tok I_1=8 A bo‘lsa, zanjirning R_2 qarshiligi aniqlansin.



11.9-masala. Zanjirning berk konturida R_2=1 Om; R_3=15 Om va R_5=10 Om li qarshiliklar ulangan bo‘lib, ularning EYUK lari ε_1=25 V; ε_2=8,5 V; ε_3=10 V ni tashkil etadi, hamda zanjirdan oqayotgan tok I_1=10 A bo‘lsa, zanjirning R_1 qarshiligi aniqlansin.



Foydalanilgan adabiyotlar

1. Steven W. Blume, Electric power system basics, 2007.

2. N.Jabborov, M.YAkubov, Elektrotexnika va elektronika asoslaridan masalalar to‘plami, O‘quv qo‘llanma, Toshkent, 2004.

3. M.Ismoilov, M.G.Xaliulin, «Elementar fizika masalalari», Toshkent, 1993.