9 - AMALIY MASHG‘ULOT. QARSHILIKLARNING PARALLEL VA KETMA-KET ULANISHLARI, HAMDA ULARGA OID MASALALAR ECHISH

Mashg‘ulotning maqsadi: Talabalarga qarshiliklarining parallel va ketma-ket ulanishlariga 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: o‘tkazgich, qarshilik, solishtirma qarshilik, o‘tkazgichning uzunligi, o‘tkazgichning kesim yuzasi.

1. Nazariy qism.

O‘tkazgichlarning ulanish usullari.

Ketma-ket ulash: O‘zaro ketma-ket ulangan o‘tkazgichlarning umumiy qarshiligi $R_{к.к}$ barcha o‘tkazgichlar qarshiliklari R_1, R_2, R_3, … , R_n ning algebraik yig‘indisiga teng:

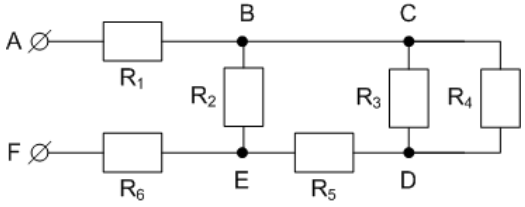
$$R_{к.к} = R_1 + R_2 + R_3 + ... + R_n .$$

Parallel ulash: O‘zaro parallel ulangan o‘tkazgichlarning umumiy qarshiligi $\frac{1}{R_{nap}}$ barcha o‘tkazgichlar qarshiliklari $\frac{1}{R_1}$, $\frac{1}{R_2}$, $\frac{1}{R_3}$, … , $\frac{1}{R_n}$ ning algebraik yig‘indisiga teng:

$$\frac{1}{R_{nap}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + ... + \frac{1}{R_m} .$$

2. Amaliy mashg‘ulotga doir namunaviy masalalar echish.

9.1-masala. Elektr zanjiriga keltirilgan R_1=2 Om; R_2=0,5 Om; R_3=1 Om; R_4=3 Om; R_5=4 Om va R_6=5 Om li qarshiliklarning miqdoriga qarab, elektr zanjiri sxemasining ekvivalent qarshiligi (R_{EKV}) aniqlansin.



Echish: Avvalo masalaning berilgan qiymatlari, hamda qarshilik-larning ketma-ket va parallel ulanish usullari asosida keltirilgan sxemasini soddalashtirish kerak.

Buning uchun qarshiliklarning parallel ulash usuli asosida, elektr zanjirining hisoblanayotgan qism qarshiligini R_7 deb belgilaymiz, ya’ni:

$$R_7 = \frac{R_3 \cdot R_4}{R_3 + R_4} = \frac{1 \cdot 3}{1+3} = \frac{3}{4} = 0{,}75 \text{ (Om)}$$

So‘ngra qarshiliklarning ketma-ket ulash usuli asosida, elektr zanjirining hisoblanayotgan qism qarshiligini R_8 deb belgilaymiz:

$$R_8 = R_5 + R_7 = 4 + 0{,}75 = 4{,}75 \text{ (Om)}$$

Qarshiliklarning parallel ulash usuli asosida, elektr zanjiri-ning hisoblanayotgan qism qarshiligini R_9 deb belgilaymiz:

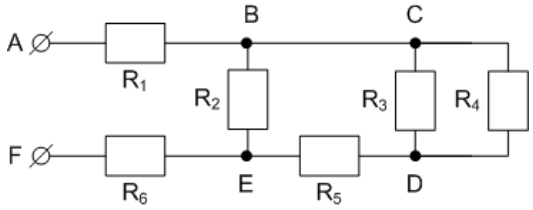
$$R_9 = \frac{R_2 \cdot R_8}{R_2 + R_8} = \frac{0{,}5 \cdot 4{,}75}{0{,}5 + 4{,}75} = \frac{2{,}375}{5{,}25} = 0{,}45 \text{ (Om)}$$

Umumiy holatda qarshiliklarning ketma-ket ulash usuli asosida, elektr zanjirining ekvivalent qarshiligini R_{ekv} hisoblaymiz:

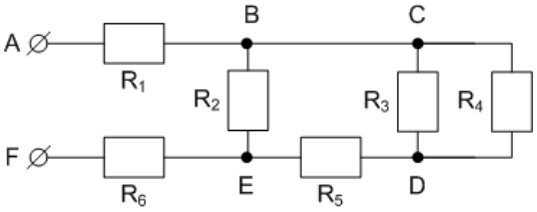
$$R_{ЭКВ} = R_1 + R_9 + R_6 = 2 + 0{,}45 + 5 = 7{,}45 \text{ (Om)}$$

3. Amaliy mashg‘ulotni bajarishga oid mustaqil variantlar.

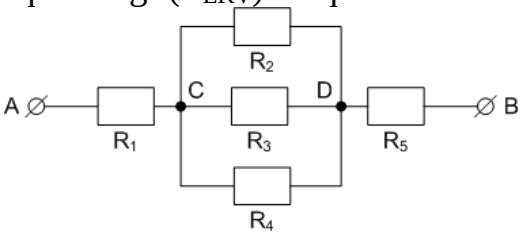
9.2-masala. Elektr zanjiriga keltirilgan R_1=3 Om; R_2=7 Om; R_3=6 Om; R_4=2 Om; R_5=5 Om va R_6=1,5 Om li qarshiliklarning miqdoriga qarab, elektr zanjiri sxemasining ekvivalent qarshiligi (R_{EKV}) aniqlansin.



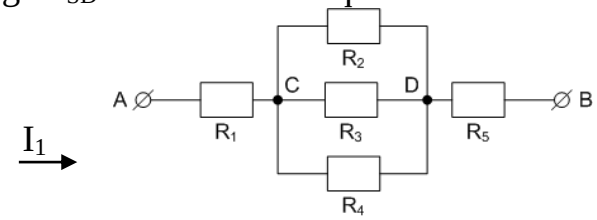
9.3-masala. Elektr zanjiriga keltirilgan R_1=2,7 Om; R_2=1,3 Om; R_3=8,7 Om; R_4=9,1 Om va R_5=10 Om li qarshiliklarning miqdoriga qarab, elektr zanjiri sxemasining ekvivalent qarshiligi (R_{EKV}) aniqlansin.



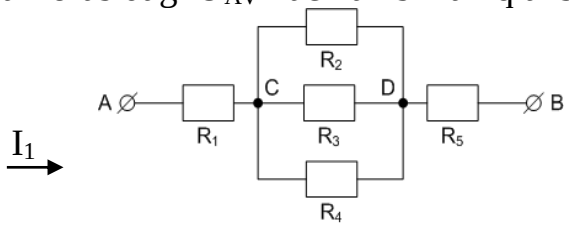
9.4-masala. Elektr zanjiriga keltirilgan R_1=3 Om; R_2=7 Om; R_3=2,5 Om; R_4=1,5 Om va R_5=6 Om li qarshiliklarning miqdoriga qarab, elektr zanjiri sxemasining ekvivalent qarshiligi (R_{EKV}) aniqlansin.



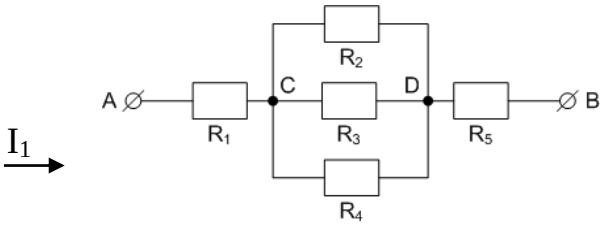
9.5-masala. Elektr zanjiriga ulangan R_1=8 Om; R_2=6 Om; R_3=5 Om; R_4=4 Om va R_5=3 Om li qarshiliklardan I_1=5 A tok oqib o‘tmoqda. Elektr zanjirining SD tugunlari orasidagi U_{SD} kuchlanishi aniqlansin.



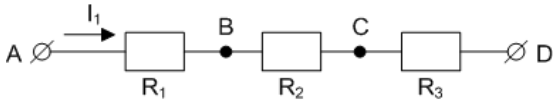
9.6-masala. Elektr zanjiriga ulangan R_1=1,5 Om; R_2=0,3 Om; R_3=0,5 Om; R_4=0,9 Om va R_5=1 Om li qarshiliklardan I_1=3 A tok oqib o‘tmoqda. Elektr zanjirining AV tugunlari orasidagi U_{AV} kuchlanishi aniqlansin.



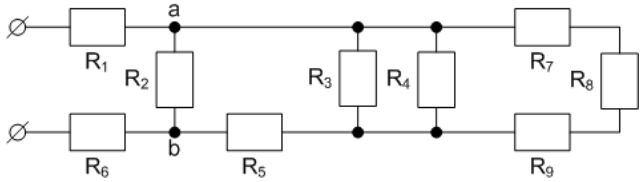
9.7-masala. Elektr zanjiriga ulangan R_5=6,7 Om li qarshilikdan I_1=2 A tok oqib o‘tmoqda. Elektr zanjirining DV tugunlari orasidagi U_{DV} kuchlanishi aniqlansin.



9.8-masala. Keltirilgan elektr zanjirida R_1=6 Om; R_2=5 Om va R_3=2 Om li qarshiliklardan I_1=5 A tok oqib o‘tmoqda. Elektr zanjirining AD tugunlari orasidagi U_{AD} kuchlanishi aniqlansin.

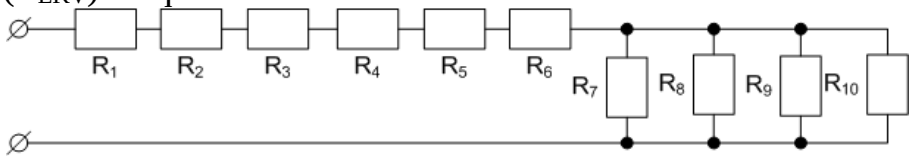


9.9-masala. Elektr zanjiriga keltirilgan R_1=2 Om; R_2=5 Om; R_3=4 Om; R_4=3 Om; R_5=2 Om; R_6=1 Om; R_7=8 Om; R_8=9 Om va R_9=5 Om li qarshiliklarning miqdoriga qarab, elektr zanjiri sxemasining ekvivalent qarshiligi (R_{EKV}) aniqlansin.

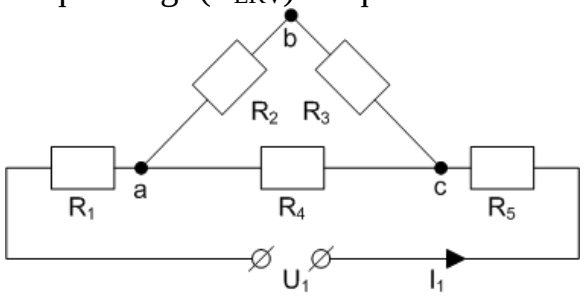


9.10-masala. Elektr zanjiriga keltirilgan R_1=0,5 Om; R_2=1 Om; R_3=1,5 Om; R_4=2 Om; R_5=2,5 Om; R_6=3 Om; R_7=1 Om; R_8=2 Om; R_9=4 Om va R_{10}=6

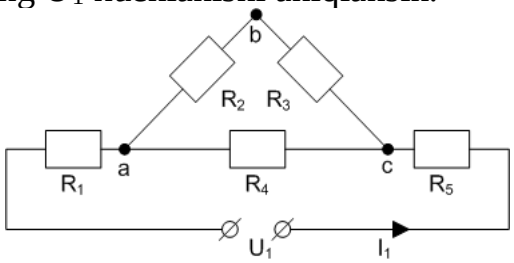
Om li qarshiliklarning miqdoriga qarab, elektr zanjiri sxemasining ekvivalent qarshiligi (R_{EKV}) aniqlansin.



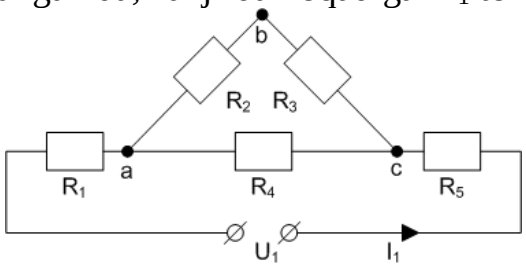
9.11-masala. Elektr zanjiriga keltirilgan R_1=15 Om; R_2=20 Om; R_3=25 Om; R_4=10 Om va R_5=12 Om li qarshiliklarning miqdoriga qarab, elektr zanjiri sxemasining ekvivalent qarshiligi (R_{EKV}) aniqlansin.



9.12-masala. Elektr zanjiriga ulangan R_1=6 Om; R_2=7 Om; R_3=5 Om; R_4=3,5 Om va R_5=5 Om li qarshiliklardan I_1=5 A li tok oqib o‘tganida, tarmoqqa ulangan elektr zanjirining U_1 kuchlanishi aniqlansin.



9.13-masala. Kuchlanishi U_1=220 V bo‘lgan elektr tarmog‘iga R_1=10 Om; R_2=5 Om; R_3=10 Om; R_4=6 Om va R_5=8 Om li qarshiliklardan tashkil topgan elektr zanjiri ulanganida, zanjirdan oqadigan I_1 tokni aniqlang.



4. Nazorat savollari

1. O‘zaro ketma-ket ulangan o‘tkazgichlarning umumiy qarshiligini topish formulasini keltiring.

2. O‘zaro parallel ulangan o‘tkazgichlarning umumiy qarshiligi qiymati qanday topiladi?

3. O‘zaro paralel yoki ketma-ket ulangan o‘tkazgichlardagi kuchlanishning qiymati qanday aniqlash mumkin?