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Methodology of Solving Complex Problems of Permanent Electric Chains

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***Abstract:** The article presents the optimal methods for solving typical problems of the "DC" section, as well as some methods for calculating complex electrical circuits, which can be used to solve problems related to electrical circuits. This will enhance the pace of problem solving of university entrants.*

***Keywords:** DC, DC sources, electromotive force (EMF), circuit diagram, electric circuit, electric network , electric circuit node, circuit, current chain consumers, resistor, Kirchhoff's and Om's laws and methods of their application.*

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The purpose of the training is to provide students with the knowledge and skills set out in the State Education Standards. Teaching can be considered successful only if the student accepts and understands the knowledge, or if the student is able to demonstrate in practice the tasks designed to improve the skills.

Bringing up our children as truly patriotic people with independent thinking, modern knowledge and professions, and a healthy life position is an issue that will never lose its relevance for us. This article will help students to overcome some of the difficulties in solving complex problems.

A feature of complex problems is that finding their solution does not always consist of a known algorithm. This research requires students to make an active effort to build general problem-solving skills rather than working on the same issues. Solving complex problems allows students to compare, collect observational experiences, identify uncomplicated mathematical laws, and make hypotheses that require proof. In this regard, it creates the conditions for the need for deductive reasoning in students. Such issues help the teacher to cultivate in students personal moral qualities such as diligence, diligence in achieving a goal. At the same time, interest in the problem, the desire to solve the problem, the confidence to find a solution to the problem, such qualities as content. In order to solve complex problems, on the one hand, it is necessary to form in students the general skills of problem solving, and on the other hand, to acquaint them with special methods.

High school students learn about physical phenomena, processes and their laws and regulations in the educational process, as well as the ability to apply theoretical knowledge in practice, to test the theory in practice, depending on certain laws and formulas. they need to learn to solve typical problems, develop and develop skills and competencies.

The formation of problem-solving skills includes the didactic structure of the lesson, the repetition and assessment of knowledge on the studied material, the formation of new skills and the development of existing ones, the organization of knowledge and skills in new conditions on the basis of modern pedagogical and innovative technologies.

Teaching students to work on complex problems in general physics is one of the most difficult problems in teaching. The effectiveness of problem-solving depends on the methodology used by the teacher and the students' mastery of generalized problem-solving techniques.

When organizing complex problem-solving lessons, it is necessary to prepare a lesson plan for each lesson in accordance with the normative requirements of the ministry of higher and secondary special education. The course consists of a brief theoretical part of the practical lesson (teaching technology, technological map) on the topic, lesson plan, purpose, quick questions to create problems in accordance with the content of the topics in order to determine the general level of knowledge of students. The main part of the lesson is focused on developing new skills and competencies. This process is closely linked to the acquisition of new practical knowledge.

The structure of the problem-solving lesson in physics is as follows:

1. Defining the purpose of the work.

2. Theoretical substantiation of the order of work.

3. Sample of the work (the teacher solves the problem as an example).

4. Student exercises (independent problem solving)

5. Summarizing and conclude the interview.

6. Assigning homework.

The content of the problem-solving lesson is characterized by two final stages of theoretical knowledge: the production of theoretical results and the practical application of theoretical conclusions.

Repetition at the beginning of the lesson increases the relevance of relevant theoretical knowledge in the second stage of the repetition process, which is related to the identification of important elements, facts, models, physical quantities, laws that are part of the theory, creates conditions for development. It should be noted that the teacher must have a syllabus of the lesson, which should contain the syllabus, blitz questions, solutions and results, and problem solving which defines the basic style of the lesson.

We know that most problems in physics are solved by the direct method, that is, the quantities sought are determined by several formulas and then calculated. At the same time, if the quantities to be determined are interrelated, a system of equations is created to find them, and they are solved together to find the values of indeterminate quantities.

However, there are such complex problems in physics that they can be solved only indirectly, that is, the quantities to be determined are not interconnected, the system of equations to find them is not connected, and they are then solved together to find the value of the quantity sought.

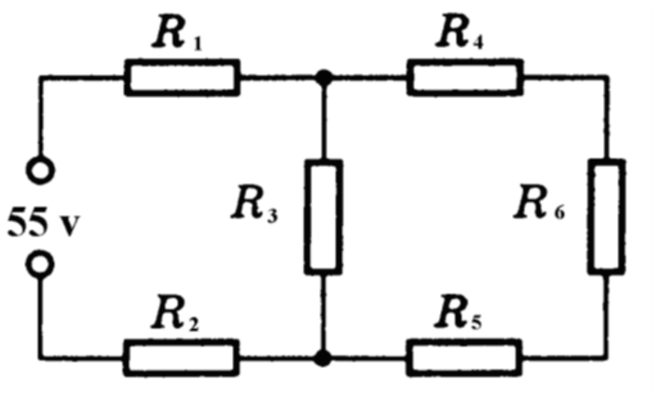
It is necessary to do the following when working on the phisic calculations:

1. Carefully read the context of the problem, identify the main question, and visualize the processes and events in the problem.
2. Write the case condition in the SI system using the accepted definitions.
3. Draw the necessary drawings related to the issue.
4. Identify a solution to the problem and make a plan for its implementation.
5. Write basic and additional formulas related to the processes in the problem condition.
6. Find the general equation by expressing the quantity sought in terms of known quantities.
7. Test the found equation by placing the units of magnitude.
8. Perform the calculation by putting the numerical value of the given quantities in the formula.
9. Check that the result is true.
10. Write the answer found as a result of working on the problem.

At the beginning of working with complex issues on the subject of constant electric circuits in academic lyceums, students learn about the laws of constant current, current strength and electric velocity, electrical resistance, electromotive force (EMF), Ohm's law for part and all of the chain, constant electricity. sources and resistors in series, parallel or mixed connection applications, Kirchhoff's laws, types of electrical circuits and connections, electrical circuits of electrical circuits, AC power supplies, power supply, electrical network, electrical network node , contour, current chain consumption 'students, resistors, equivalent circuit for resistors in an electric circuit, Kirchhoff and Om's law application methods must be directly familiar with theoretical knowledge.

Let's take a look at how complex resistors work in combination:

Task 1. Find the distribution of currents and voltages, each of which has a resistance of 2Ō, with the same resistance as all the resistors in the circuit shown in the diagram.



We calculate the total resistance of the chain R4; R5; Since resistors R6 are connected in series and resistors R3 are connected in parallel, their total resistance is found as follows.

R456 =R4+ R5+ R6 =2+2+2=6Ω

$$\frac{1}{R_{3456}} = \frac{1}{R_3} + \frac{1}{R_{456}} = \frac{1}{2} + \frac{1}{6} = \frac{4}{6}$$

$$R_{3456} = 1{,}5\Omega$$

$R_{umum} = R_1 + R_{3456} + R_2$

The total current in a circuit is governed by the law of Om

$$I = \frac{U}{R_{um}} = \frac{55}{5{,}5} = 10A$$

For the resistance of resistors R1 and R2 are equal and for I1 and I2 are connected in series

I= I1 = I2 = 10A. U1 =U2 =I1 ·R1 =10 · 2 = 20V.

For resistors R1, R2 and R3 are connected in series

U = U1 +U2 +U3 ; U3 = U – U1 +U2 = 55-20=15V.

From them we have the result of $I_3 = \frac{U_3}{R_3} = \frac{15}{2} = 7{,}5A$ and R4 , R5 va R6 for the resistors are connected in series we will have this result I4 = I5 = I6 = I1 – I3 = 10 - 7,5 = 2,5A

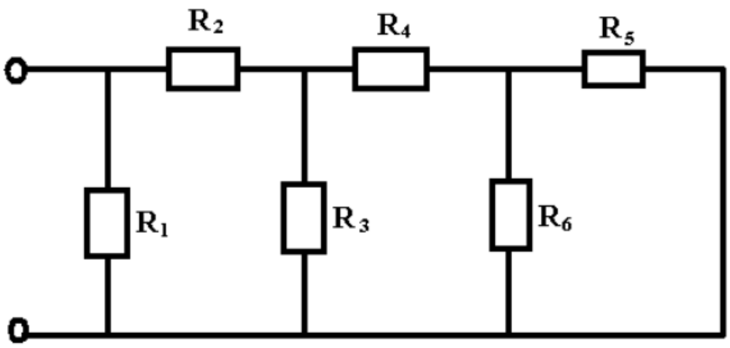
The results found U4 = U5 = U6 = I4 ·R4 = 2,5 · 2 = 5V.

We record all the results in the table:

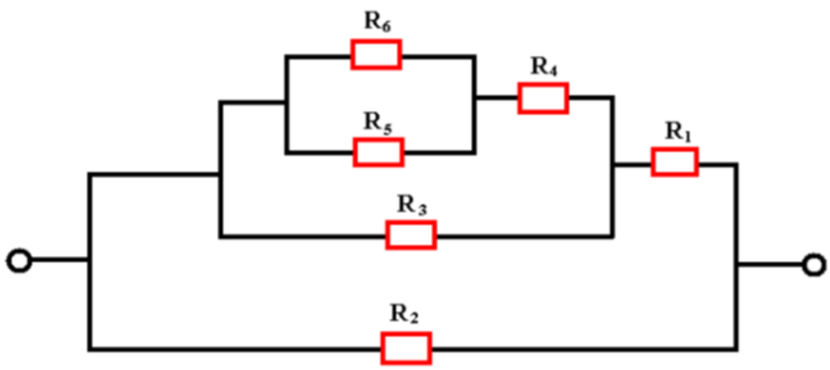
№	R_{um}, Ω	$I_1 = I_2$, A	$U_1 = U_2$, V	U_3, V	I_3, A	$I_4 = I_5 = I_6$, A	$U_4 = U_5 = U_6$, V
1	5,5	10	20	15	7,5	2,5	5

Task 2 . Find the total resistance of the chain.

R1 =R; R2 = 2R; R3 =4/3 R; R4 =3R; R5 = 2R; R6 = 2R



We simplify the scheme as follows:



$$\frac{1}{R_{56}} = \frac{1}{R_5} + \frac{1}{R_6} = \frac{1}{2R} + \frac{1}{2R} = \frac{1}{R};\ R_{56} = R$$

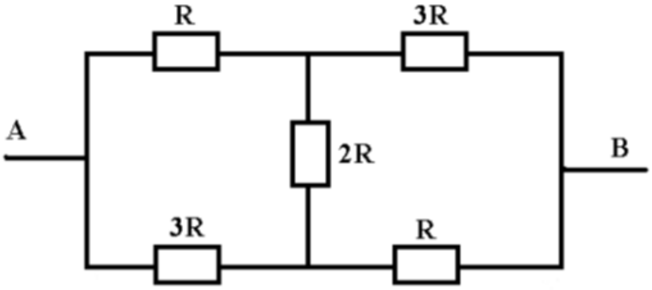
$$R_{456} = R_{56} + R_4 = R + 3R = 4R$$

$$\frac{1}{R_{3456}} = \frac{1}{R_3} + \frac{1}{R_{456}} = \frac{3}{4R} + \frac{1}{4R} = \frac{1}{R};\ R_{3456} = R$$

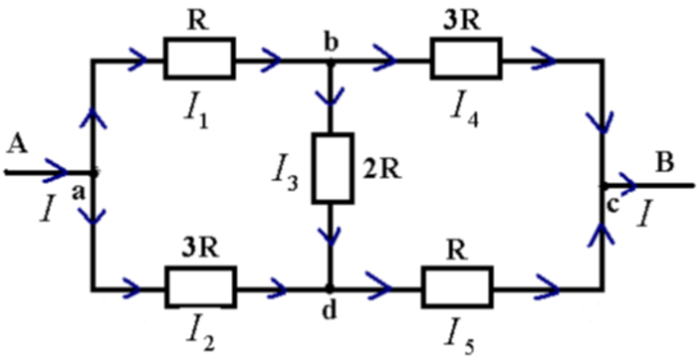
$$R_{13456} = R_1 + R_{3456} = R + R = 2R$$

$$\frac{1}{R_{um}} = \frac{1}{R_{13456}} + \frac{1}{R_2} = \frac{1}{2R} + \frac{1}{2R} = \frac{1}{R};\ R_{um} = R$$

Task 3. Find the total resistance between the points AB?



To find the total resistance of the circuit, we write the direction of current in the resistors.



From Krixgoff's rule 1 we get:

I=I_1+I_2 (a)

I_1=I_3+I_4 (b)

I_5=I_2+I_3 (c)

I=I_4+I_5 (d)

The electric charge q travels from point A to point B in 4 different ways. That is (abc, adc, abdc and adbc). The total work done by the charge is equal to the sum of the work done by each resistor.

For abc contour

A=A_1+A_4; qU=qU_1+qU_4; U=U_1+U_4;

I·R_AB=I_1·R+I_4·3R (1)

for adc contour

A=A_2+A_5; qU=qU_2+qU_5; U=U_2+U_5;

I·R_AB=I_2·3R+I_5·R (2)

for abdc contour

A=A_1+A_3+A_5; qU=qU_1+qU_3+qU_5; U= 〖U_1+U〗_3+U_5;

I·R_AB=〖I_1·R+I〗_3·2R+I_5·R (3)

for adbc contour

A=A_2+A_3+A_4; qU=qU_2+qU_3+qU_4; U=〖U_2+U〗_3+U_4;

I·R_AB=〖I_2·3R-I〗_3·2R+I_4·3R (4)

We equate formulas 1 and 2:

I·R_AB+I_4·3R=〖I_2·3R+I〗_5·R; I+〖3I〗_4=3〖I_2+I〗_5 (4.1)

We equate formulas 3 and 4:

a system:

$$\begin{cases} I_1 + 3I_4 = 3I_2 + I_5 \\ I_1 + 4I_3 + I_5 = 3I_2 + 3I_4 \end{cases}$$

Instead of I1 we give formula (b):

$$\begin{cases} I_3 + I_4 + 3I_4 = 3I_2 + I_5 \\ I_3 + I_4 + 3I_3 + I_5 = 3I_2 + 3I_4 \end{cases}$$

We separate the system:

$$-4I_3 + 3I_4 - I_5 = I_5 - 3I_4;\ 6I_4 = 2I_5 + 4I_3\ ;\ 3I_4 = I_5 + 2I_3$$

For the final result (c) we give the result:

$$\begin{cases} 3I_4 = I_2 + I_3 + 2I_3 \\ 3I_4 = I_2 + 3I_3\ (5) \end{cases}$$

We equate formulas 1 and 4:

$$I_1 + 3I_4 = 3I_2 - 2I_3 + 3I_4;\ I_1 = 3I_2 - 2I_3$$

To the final result (b) we give the result:

$$I_3 + I_4 = 3I_2 - 2I_3\ ;\ 3I_3 + I_4 = 3I_2\ (6)$$

We simplify the system of results 5 and 6:

$$\begin{cases} 3I_3 + I_4 = 3I_2 \\ 3I_4 - 3I_3 = I_2 \end{cases}$$

We will add the system

$$4I_4 = 4I_2;\ I_4 = I_2$$

If we systematize the results b and c and give the final result,

$$-\begin{cases} I_1 = I_3 + I_4 \\ I_5 = I_2 + I_3 \end{cases}$$

$$from\ I_1 - I_5 = I_4 - I_3;\ (I_4 = I_2)\ we\ will\ get\ this\ result\ I_1 = I_5$$

Substituting these results into formula 5,

$$3I_4 - I_2 = 3I_3\ (I_4 = I_2 \text{ from this})\ 2I_4 = 3I_3\ from\ this\ I_3 = \frac{2}{3}\ I_4$$

We bring these results to formula 4.2:

$$I_1 + 4I_3 + I_5 = 3I_2 + 3I_4\ (based\ on\ I_1 = I_5 \text{ va } I_4 = I_2\ )$$

$$based\ on\ 2I_1 + 4I_3 = 6I_4;\ I_3 = \frac{2}{3}\ I_4$$

We will have $2I_1 + 4 \cdot \frac{2}{3} I_4 = 6I_4 \ \Rightarrow\ I_1 = \frac{5}{3} I_4 \ \Rightarrow\ I_4 = \frac{3}{5} I_1$

We bring the final result to the formula (a):

Based on $I = I_1 + I_2\ (a)\ \ I_4 = I_2$

$$I = I_1 + I_4 \ \Rightarrow\ I = I_1 + \frac{3}{5} I_1 \ = \frac{8}{5} I_1 \ \ \Rightarrow$$

$$\Rightarrow\ I_1 = \frac{5}{8} I;\ I_4 = \frac{3}{5} I_1 \ \Rightarrow\ I_4 = \frac{3}{5} \cdot \frac{5}{8} I = \ \frac{3}{8} I$$

$$I \cdot R_{AB} = I_1 \cdot R + I_4 \cdot 3R;\ \Rightarrow\ I \cdot R_{AB} = \ \frac{5}{8} I \cdot R + \frac{3}{8} I \cdot 3R$$

So $R_{AB} = \ \frac{5}{8} R + \frac{9}{8} R \ \Rightarrow\ R_{AB} = \ \frac{14}{8} R = \frac{7}{4} R;$

The answer of the problem is $R_{AB} = \frac{7}{4} R$.

Conclusion: The above methods of solving this type of problem will create convenience for university entrants and will significantly increase the speed of problem solving.

References:

1. M.S.Sedrik, “Umumiy fizika kursidan masalalar to’plami”. O’quv. –T.: O’qituvchi, 1991. -240 b.
2. M. Djorayev. Fizika o‘qitish metodikasi. Toshkent.TDPU. 2013. B. 255.
3. V.A.Balash, «Задачи по физике и методы их решения», M. 1983.