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## **EXPERIENCE IN USING INFORMATION TECHNOLOGIES IN LABORATORY EXERCISES ON THE COURSE OF ELECTROMECHANICS**

*The article provides a detailed analysis of the main advantages and possibilities of using modern computer technologies for conducting laboratory studies by students of electrical engineering specialties, as well as computer modeling using the example of a DC motor.*

*Keywords: electrical machines, electric drive, Matlab / Simulink, computer technologies, modeling.*

Electric machines and electric drives are widely used in all sectors of the national economy and are one of the most energy-intensive consumers and energy converters. In this regard, knowledge of the theory in these areas is a necessary element and an important component of the professional training of an electrical specialist in the labor market. Today, the achievement of such a goal is possible only with the use of new forms of education using new computer technologies based on modern applied software packages, which are based on mathematical and simulation methods of modeling [3]. Software packages allow you to qualitatively change and significantly improve the study technology, create virtual laboratories and carry out the necessary research in it with obtaining quantitative results, including in the form of reports, graphs, diagrams, etc. [4, 6].

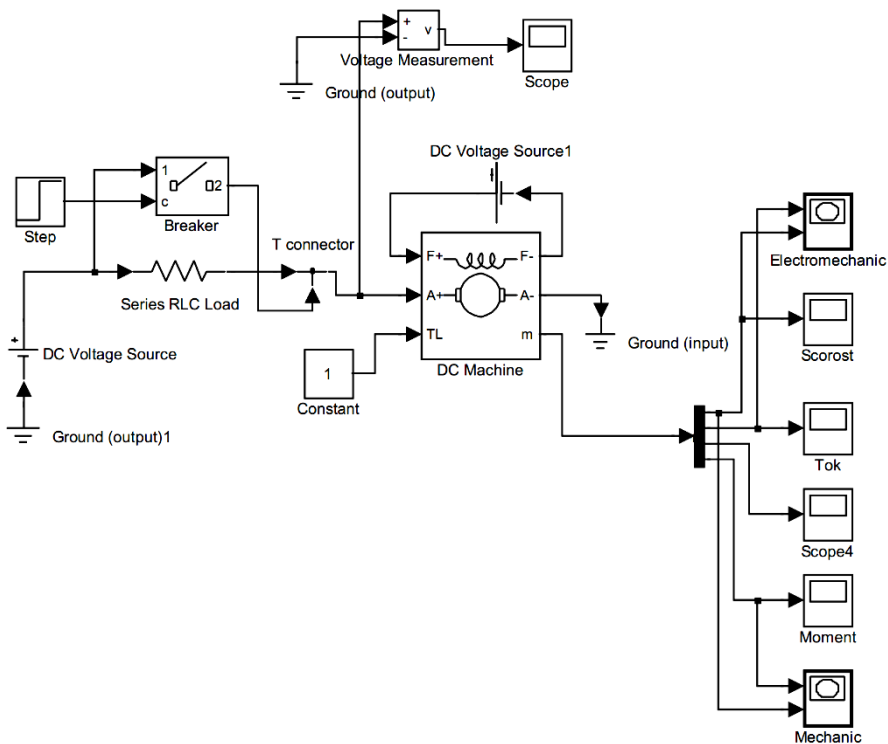
There are numerous computer simulation programs that can be distinguished by their method of operation, as programs for:

- mathematical modeling;
- modeling of block diagrams by transfer functions;
- simulation of electronic circuits;

Each of the listed programs may differ in their intended purpose, for example, programs for mathematical modeling are used at the stage of primary analysis, which allow one to determine some of the numerical characteristics of the system being developed, and programs for modeling structural diagrams make it possible to assess the system's response to various control and disturbing influences [5, 7]. Electronic circuit simulation programs are used to analyze and optimize the electronic part of an electric drive, taking into account the characteristics of the specific elements used.

For a modern student and specialist, computers have become a tool in the study of certain theoretical foundations, and future engineers should also not only master the basics of theory in a particular area, but also be able to solve problems using modern information technology [8]. At the Department of Power Supply and

Automation of the Khujand Polytechnic Institute of the TTU named after academician M.S. Osimi practices using the MATLAB / Simulink program for conducting laboratory studies in the course of electromechanics, electrical machines, as well as for completing coursework and diploma works for bachelors of specialties 1-530105 - "Automated electric drives" and 1-430103 - "Power supply". To demonstrate the effectiveness of using the MATLAB program in laboratory exercises in the course of electromechanics, the article provides an example of a study of a direct current motor (DCM) using this program [1, 2, 9-12]. Figures 1 and 2 show the model for the study of DCM and the window for setting the DCM parameters.



*Fig. 1. Computer model for the study of DC motor*

After creating a model and entering the parameters of the model elements, you can start using the model and exploring the object. The results of DCM simulation are shown in Figures 3-5.

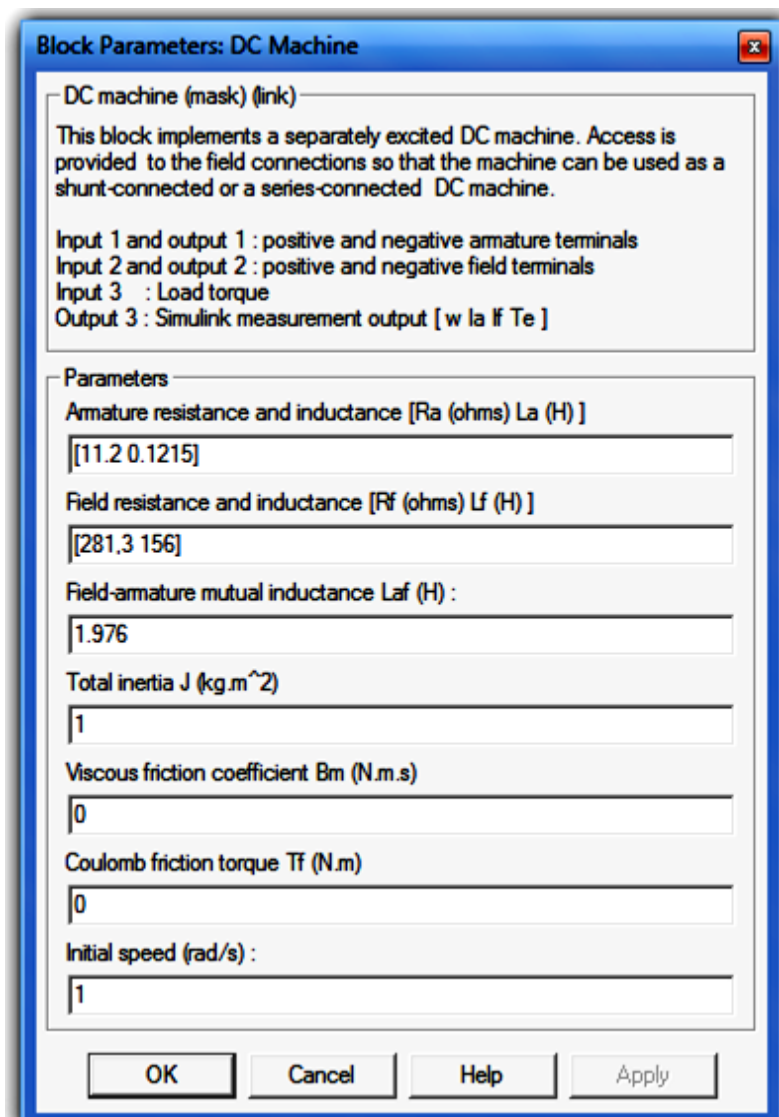


Fig. 2. The window for setting the parameters of DC motor

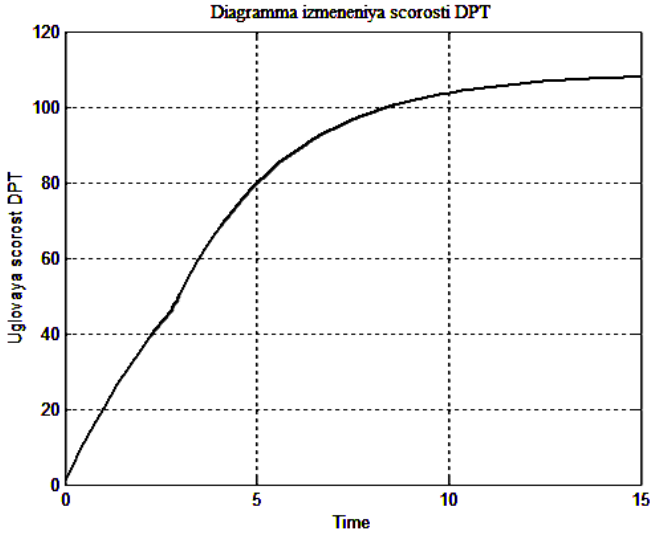


Fig. 3. The diagram of the change in the speed of the DCM at start

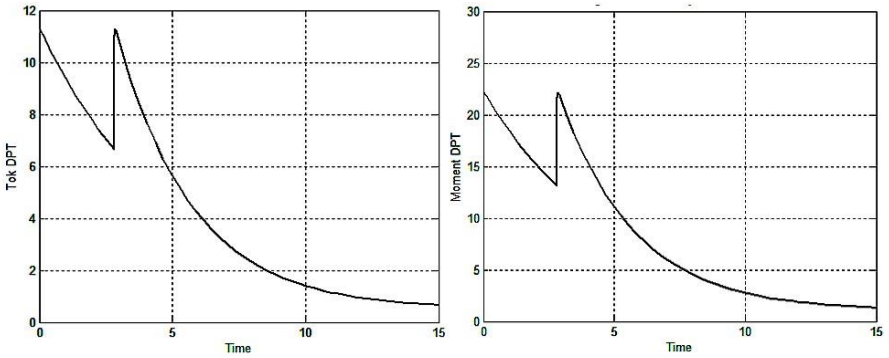


Fig. 4. Graphs of transient processes of current and torque DCM at start

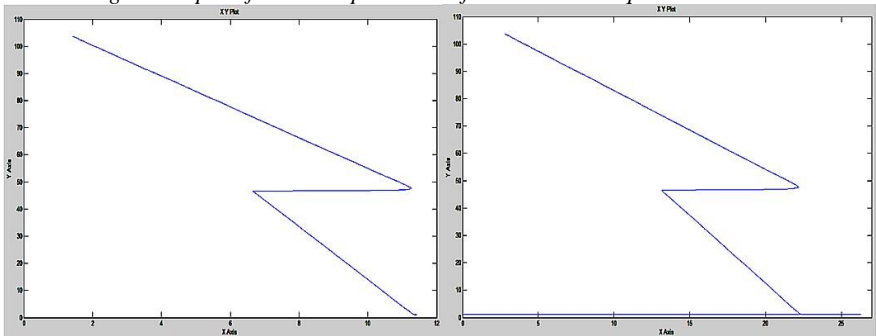


Fig. 5. Current-speed and torque-speed characteristics of DC motor at start-up

Thus, computer technologies greatly simplify the process of conducting laboratory studies, as well as facilitate the work of design engineers, increase the efficiency of research, and the accuracy of calculations at low cost of financial and material resources. It should be noted that the use of computer technology does not exempt students and specialists from general physical literacy and deep knowledge of the physical processes occurring in the elements of electrical systems.

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