

INTRODUCTION

The electrical engineering (in a wide sense of this word) is said to be extensive field of practical use of electromagnetic phenomena. The wide and various application of electrical energy are caused by its doubtless advantages over other forms of energy. It is rather simply converted to and from other forms of energy. It is almost instantaneous transmitted over long distances without great losses.

The quantities describing electromagnetic processes, which occur in different electric devices, are usually measured and recorded with a high degree of accuracy. Then these processes can be analyzed, modulated and calculated. Certainly, an analysis and a design, mounting and maintenance of electric installations require, as a rule, high-qualified personnel.

It is necessary for professionals working in any branch of electrical engineering to have a certain amount of knowledge, therefore, fundamental educational discipline *Fundamentals of electrical engineering* was set up in the system of higher electrical engineering education. A subject of the discipline is the study of qualitative and quantitative aspects of electromagnetic processes and phenomena occurring in different devices. It is the basis for a subsequent study of the special electrical engineering disciplines.

In turn *Fundamentals of electrical engineering* is founded on the knowledge obtained in courses of physics (electricity and magnetism) and mathematics (fundamentals of Mathematical Analysis). In *Fundamentals of electrical engineering* these knowledge are being extended and explicated in the direction of the development of methods of analyses and synthesis in research of processes and phenomena occurring in the electrical and magnetic circuits and electromagnetic fields. Therefore *Fundamentals of electrical engineering* has also an independent importance for a formation of electric engineering culture of the next specialists.

The teaching aid offered to the readers is written on the basis of the lectures on *Fundamentals of electrical engineering*, which were delivered for the students of Electrotechnical Institute of Tomsk Polytechnic University. The volume of the delivered material corresponds to the number of lecture hours. The aid is intended to facilitate the assimilation and understanding of the course (especially in distance learning).

The aid is divided into two parts unlike the previous edition which consisted of four blocks [6-9]. The authors refused to split a text into the separate

lectures, it is more convenient for a reader and allows you to change the sequence of a study of some themes.

The first part contains the sections devoted to the physical principles of electrical engineering, basic concepts of circuit theory, steady states conditions of electrical circuits with the sources of direct current, sinusoidal and nonsinusoidal voltages and currents. For students specializing in the field of electricity and electromechanics, the material on *Three-phase circuits* (static and dynamic) is adequately presented. The theory of two-ports, including the electrical filters, is briefly reviewed.

The transient processes in linear circuits, nonlinear electric and magnetic circuits, steady and transient processes in the circuits with distributed parameters are considered in the second part of the aid. The fundamentals of the theory of electromagnetic field are briefly expounded.

All the sections of the aid contain the practical examples of theory application. A detailed solution of common problems is accompanied with the numerical calculations, building and analysis of the graphs and vector diagrams.