

Preface

The book has basically emerged from my lectures on “Electrical Circuits in Biomedical Engineering” at Yeditepe University since 2004 and it is aimed to assist the students in solving general and application-specific problems of Electrical Circuits in Biomedical Engineering at undergraduate and graduate levels.

Majority of the problems given in this book are self-contained and have varying levels of difficulty to encourage the student. Problems that deal with SPICE or MATLAB simulations are particularly intended to guide the student to understand the nature and specific aspects of these problems.

Due to lack of space and their secondary significance in biomedical engineering field, some topics such as three-phase power circuits, time-varying and nonlinear networks, state-space analysis, graph theory, and a relatively new topic of memristors are not included in this book. Neither nonstandard electrical network concept, nor hyper-real currents or voltages are within the scope of this book. Nevertheless, typical infinite electrical circuits are illustrated with sample problems, since they appeal some interest among the students in different engineering and science fields.

Attempt is made to show all steps of calculations in the solutions of problems. Relevant references are included at the end of each chapter. A separate bibliography of useful textbooks related to specific topics of interest is provided at the end of the book, as well.

Here you will also find software that supplements this book. These include EXCEL (xlsx files), MATLAB (.m files), and SPICE (.cir) files. The names of the files used for the solution of a problem are indicated at the end of each corresponding problem statement.

In order to run these software applications, one needs to have Microsoft’s EXCEL (2013) and MathWorks’ MATLAB (version R2009a or higher, along with symbolic and curve fitting toolboxes). On the other hand, student versions of SPICE main operating software source codes (such as PSPICE, HSPICE, AIMSPICE, ISPICE, 5SPICE, XSPICE, ADICE, LTSPICE, NGSPICE) can be freely downloaded via the net.

It is hoped that the book will be helpful for students, as well as for engineers in analyzing and/or designing practical biomedical instrumentation circuits.

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Problems with Solutions

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