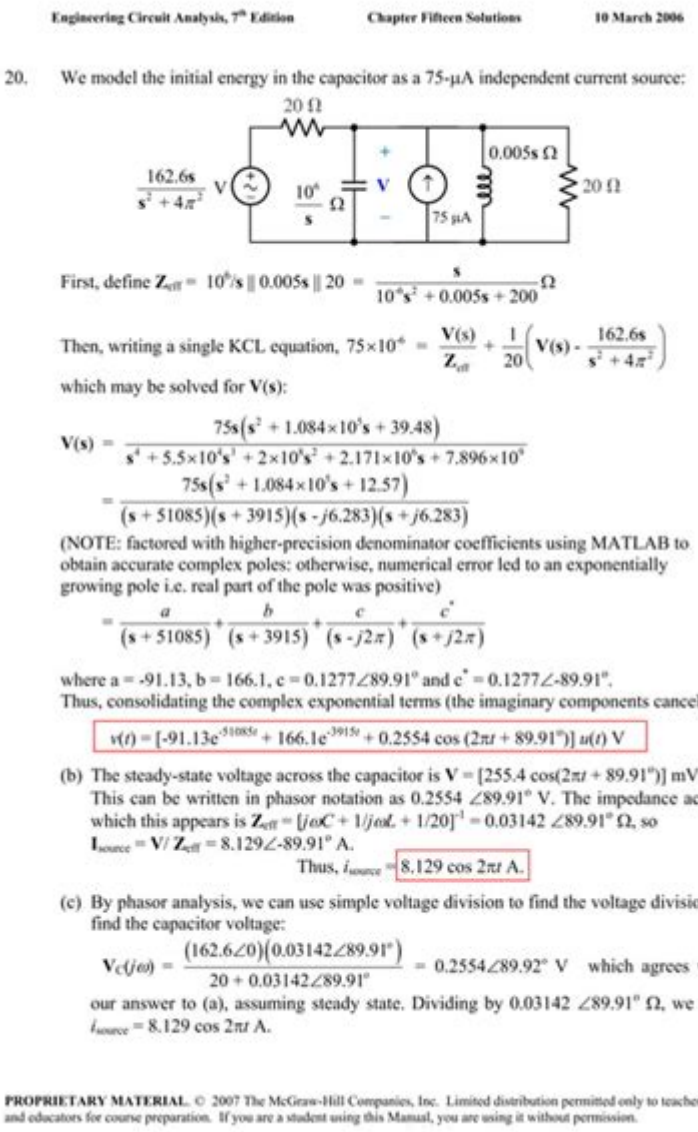
Engineering Circuit Analysis 7th Edition Solutions



Engineering Circuit Analysis, 7th Edition Chapter Fifteen Solutions 10 March 2006

20. We model the initial energy in the capacitor as a 75-μA independent current source:

First, define $\mathbf{Z}_{eff} = 10^6/\mathbf{s} \parallel 0.005\mathbf{s} \parallel 20 = \dfrac{\mathbf{s}}{10^{-6}\mathbf{s}^2 + 0.005\mathbf{s} + 200}\ \Omega$

Then, writing a single KCL equation, $75\times10^{-6} = \dfrac{\mathbf{V(s)}}{\mathbf{Z}_{eff}} + \dfrac{1}{20}\left(\mathbf{V(s)} - \dfrac{162.6\mathbf{s}}{\mathbf{s}^2+4\pi^2}\right)$

which may be solved for **V**(s):

$$\mathbf{V(s)} = \frac{75\mathbf{s}\left(\mathbf{s}^2 + 1.084\times10^5\mathbf{s} + 39.48\right)}{\mathbf{s}^4 + 5.5\times10^4\mathbf{s}^3 + 2\times10^9\mathbf{s}^2 + 2.171\times10^5\mathbf{s} + 7.896\times10^9}$$

$$= \frac{75\mathbf{s}\left(\mathbf{s}^2 + 1.084\times10^5\mathbf{s} + 12.57\right)}{(\mathbf{s}+51085)(\mathbf{s}+3915)(\mathbf{s}-j6.283)(\mathbf{s}+j6.283)}$$

(NOTE: factored with higher-precision denominator coefficients using MATLAB to obtain accurate complex poles: otherwise, numerical error led to an exponentially growing pole i.e. real part of the pole was positive)

$$= \frac{a}{(\mathbf{s}+51085)} + \frac{b}{(\mathbf{s}+3915)} + \frac{c}{(\mathbf{s}-j2\pi)} + \frac{c^*}{(\mathbf{s}+j2\pi)}$$

where a = -91.13, b = 166.1, c = 0.1277∠89.91° and c^* = 0.1277∠-89.91°.
Thus, consolidating the complex exponential terms (the imaginary components cancel),

$$v(t) = [-91.13e^{-51085t} + 166.1e^{-3915t} + 0.2554\cos(2\pi t + 89.91°)]\,u(t)\ \text{V}$$

(b) The steady-state voltage across the capacitor is **V** = [255.4 cos(2π*t* + 89.91°)] mV
This can be written in phasor notation as 0.2554 ∠89.91° V. The impedance across which this appears is $\mathbf{Z}_{eff} = [j\omega C + 1/j\omega L + 1/20]^{-1} = 0.03142\ \angle 89.91°\ \Omega$, so
$\mathbf{I}_{source} = \mathbf{V}/\mathbf{Z}_{eff} = 8.129\angle -89.91°$ A.
Thus, $i_{source} = 8.129\cos 2\pi t$ A.

(c) By phasor analysis, we can use simple voltage division to find the voltage division to find the capacitor voltage:

$$\mathbf{V}_c(j\omega) = \frac{(162.6\angle 0)(0.03142\angle 89.91°)}{20 + 0.03142\angle 89.91°} = 0.2554\angle 89.92°\ \text{V}$$ which agrees with our answer to (a), assuming steady state. Dividing by 0.03142 ∠89.91° Ω, we find $i_{source} = 8.129\cos 2\pi t$ A.

Engineering circuit analysis 7th edition solutions provide essential resources for students and professionals looking to deepen their understanding of circuit analysis concepts and applications. This comprehensive guide not only covers the theoretical aspects of circuit analysis but also offers a plethora of solved problems and exercises that help reinforce learning. Whether you are tackling complex circuit problems in class or preparing for engineering exams, the solutions manual for the 7th edition of Engineering Circuit Analysis is an indispensable tool.

Overview of Engineering Circuit Analysis

Engineering circuit analysis is a foundational subject in electrical engineering that focuses on

understanding how electrical circuits function. The 7th edition of the classic textbook, authored by William H. Hayt, Jack E. Kemmerly, and Steven M. Durbin, provides a modern approach to circuit theory, integrating advanced topics while maintaining clarity for students.

Key Features of the 7th Edition

The 7th edition of Engineering Circuit Analysis includes several key features that enhance the learning experience:

- **Comprehensive Coverage:** The textbook covers a wide range of topics, including circuit laws, network theorems, transient analysis, and sinusoidal steady-state analysis.
- **Numerous Examples:** Throughout the chapters, there are numerous worked examples that illustrate key concepts and methodologies.
- **Practice Problems:** Each chapter includes a variety of problems, ranging from basic to advanced, allowing students to test their understanding.
- **Solutions Manual:** The accompanying solutions manual provides detailed solutions to the problems presented in the textbook, making it easier for students to learn from their mistakes.

Understanding the Importance of Solutions Manuals

Solutions manuals play a crucial role in the learning process for engineering students. Here are some reasons why the Engineering Circuit Analysis 7th edition solutions manual is beneficial:

Enhanced Learning Experience

The solutions manual offers step-by-step explanations for solving circuit problems, allowing students to follow along and understand the reasoning behind each solution. This is particularly important in a subject like circuit analysis, where multiple methods can be applied to reach the same answer.

Self-Assessment

With access to the solutions, students can check their work against the correct answers, helping them identify areas where they may need further study or practice. This self-assessment helps in reinforcing learning and building confidence.

Preparation for Exams

The solutions manual provides students with a valuable resource for exam preparation. By practicing problems and reviewing the solutions, students can enhance their problem-solving skills and be better prepared for assessments.

Common Topics Covered in the Solutions Manual

The Engineering Circuit Analysis 7th edition solutions manual addresses a variety of topics that are essential for mastering circuit analysis:

1. **Basic Circuit Concepts:** Understanding voltage, current, resistance, and power.
2. **Ohm's Law and Kirchhoff's Laws:** Application of fundamental laws to analyze circuits.
3. **Node-Voltage and Mesh-Current Analysis:** Techniques for solving complex circuits.
4. **Thevenin's and Norton's Theorems:** Simplifying circuits to make analysis easier.
5. **AC Circuit Analysis:** Studying circuits with alternating current, including phasors and impedance.
6. **Transient Response:** Analyzing circuits' behavior over time when subjected to changes.

How to Effectively Use the Solutions Manual

To make the most of the Engineering Circuit Analysis 7th edition solutions manual, consider the following tips:

1. Work Through Problems Independently

Before consulting the solutions manual, attempt to solve the problems on your own. This practice helps to reinforce concepts and improves problem-solving skills.

2. Use the Solutions as Learning Tools

When reviewing the solutions, pay close attention to the methodologies used. Take notes on different approaches and techniques that may be useful for similar problems in the future.

3. Collaborate with Peers

Study groups can be a great way to enhance understanding. Discuss problems and solutions with classmates to gain new perspectives and insights.

4. Focus on Weak Areas

Identify specific topics where you struggle and use the solutions manual to work through additional problems in those areas. This targeted practice can significantly improve your comprehension.

Additional Resources for Circuit Analysis

While the Engineering Circuit Analysis 7th edition solutions provide a solid foundation, there are additional resources that can further enhance your learning experience:

- **Online Tutorials:** Websites like Khan Academy and Coursera offer free courses on electrical engineering topics, including circuit analysis.
- **YouTube Channels:** Channels such as “ElectroBOOM” and “EEVblog” provide engaging content that can help clarify complex concepts.
- **Software Tools:** Simulation software like LTspice and Multisim can provide hands-on experience in circuit design and analysis.
- **Supplementary Textbooks:** Books like “Fundamentals of Electric Circuits” by Alexander and Sadiku can provide additional practice and explanations.

Conclusion

In summary, **engineering circuit analysis 7th edition solutions** are vital for students pursuing a career in electrical engineering. The solutions manual not only enhances the learning experience through detailed explanations and practice problems but also serves as a critical tool for self-assessment and exam preparation. By utilizing the solutions manual effectively, along with additional resources, students can build a strong foundation in circuit analysis that will benefit them throughout their academic and professional careers. Whether you are just beginning your studies or looking to reinforce your knowledge, the 7th edition solutions manual is an essential companion in your journey through engineering circuit analysis.

Frequently Asked Questions

What are the key features of the 'Engineering Circuit Analysis 7th Edition' solutions?

The solutions provide detailed step-by-step explanations, a focus on conceptual understanding, and numerous practice problems to enhance learning.

Where can I find the solutions for 'Engineering Circuit Analysis 7th Edition'?

Solutions can typically be found in the official textbook's companion website, educational resource platforms, or through academic libraries.

Are the solutions for 'Engineering Circuit Analysis 7th Edition' available for free?

While some solutions may be available for free through educational resources, comprehensive solutions often require a purchase or subscription.

How can the solutions for 'Engineering Circuit Analysis 7th Edition' help students?

They assist in understanding complex circuit concepts, provide examples of problem-solving techniques, and serve as a reference for homework and exam preparation.

Is there a difference between the solutions for the 7th edition and previous editions?

Yes, the 7th edition solutions may include updated examples, revised problems, and new technology applications that reflect current engineering practices.

Can I use the solutions from 'Engineering Circuit Analysis 7th Edition' for self-study?

Absolutely, the solutions are designed to facilitate self-study by providing clear explanations and examples that reinforce the material covered in the textbook.

Are there any online resources for 'Engineering Circuit Analysis 7th Edition' solutions?

Yes, platforms like Chegg, Course Hero, and various educational forums often provide access to solutions and discussions related to the textbook.

How do the solutions in 'Engineering Circuit Analysis 7th

Edition' address real-world engineering problems?

The solutions incorporate practical examples and case studies that demonstrate how circuit analysis concepts apply to real-world engineering challenges.

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