

Network Theory Homework 3

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Homework is not to be submitted. If you prepare a solution and upload it to Moodle, you may be eligible for extra credit, as per the course rules.

“Valkenburg” is the book “Network Analysis, 3rd Edition” by M. E. Van Valkenburg.

This homework tests your understanding of how to write network equations according to node variable analysis, loop variable analysis, state variable analysis, the notion of equivalence of circuits, and the notion of duality. You should know how to count the number of equations that will result, before writing down the equations. You should be clear on how the notions of spanning trees and cycles apply to these procedures.

1. Chapter 3 of Valkenburg, Solved Examples 1 through 14.
2. Let n be an integer. We define the graph H_n (known as the n -dimensional Boolean hypercube) as follows: the nodes $N = \{0, 1\}^n$ are all the n -bit binary strings. The edges $E = \{e \mid s(e) \text{ and } t(e) \text{ differ in only one position}\}$. That is, if e is an edge, then there exists j such that $s(e) - t(e)$ is zero in every coordinate $k \neq j$ and is either 1 or -1 in the j 'th coordinate.
 - (a) How many edges does H_n have?
 - (b) How many cycles does H_n have?
 - (c) If $n = 100$, is it better to perform node variable analysis or loop variable analysis for a circuit with graph H_n ? Justify your answer.
3. The following problems from Valkenburg, Chapter 3: 3.2, 3.17, 3.18, 3.19 (note the figure is on page 59), 3.30, 3.31, 3.32, 3.50