Reading

Textbook: *Numerical Methods for Engineers*, 7th Ed.
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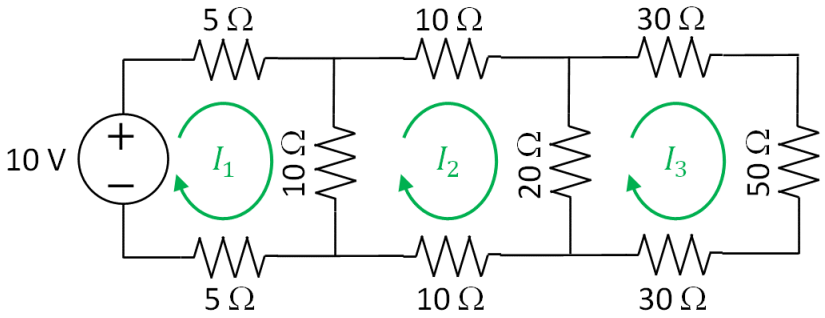
McGraw Hill

Assignment: Read Chapters 9 – 12

Problem #1: System of Equations

Part (a) – Derive System of Equations

Derive three loop equations based on the currents I_1, I_2 and I_3 in the circuit below.



Simplify the equations so they have the general form of

$$a_{11}I_1 + a_{12}I_2 + a_{13}I_3 = b_1 \quad (1)$$
$$a_{21}I_1 + a_{22}I_2 + a_{23}I_3 = b_2 \quad (2)$$
$$a_{31}I_1 + a_{32}I_2 + a_{33}I_3 = b_3 \quad (3)$$

Part (b) – Solve System of Equations by Hand

Solve the system of three equations derived above using just algebraic substitution (i.e., no matrices, Cramer's rule, etc.).

Problem #2: Solution Using Linear Algebra

Do the following by hand:

(a) Write Eqs. (1)-(3) in matrix form as $[A][i] = [b]$.
(b) Calculate the inverse of the coefficient matrix $[A]$ using the Gauss-Jordan method.
(c) Calculate the unknown terms using matrix multiplication $[i] = [A]^{-1}[b]$.

Problem #3: Write a MATLAB Program to Calculate $[A]^{-1}$

Write a computer program in MATLAB that implements the Gauss-Jordan method to calculate a matrix inverse. The program should be able to handle a square matrix of any size. Use it to calculate the inverse in Problem 2. Show the result generated by MATLAB.

Problem #4: Matrix Algebra

Solve the following matrix equation for $[A]$ and simplify as much as possible.

$$[I]=\left\{\left(\left[B\right]^{-1}\right)^{T}[D]+[I]\right\}\left\{\left(\left[A\right]^{-1}\right)^{T}[C]^{T}[D]+[I]\right\}^{-1}$$