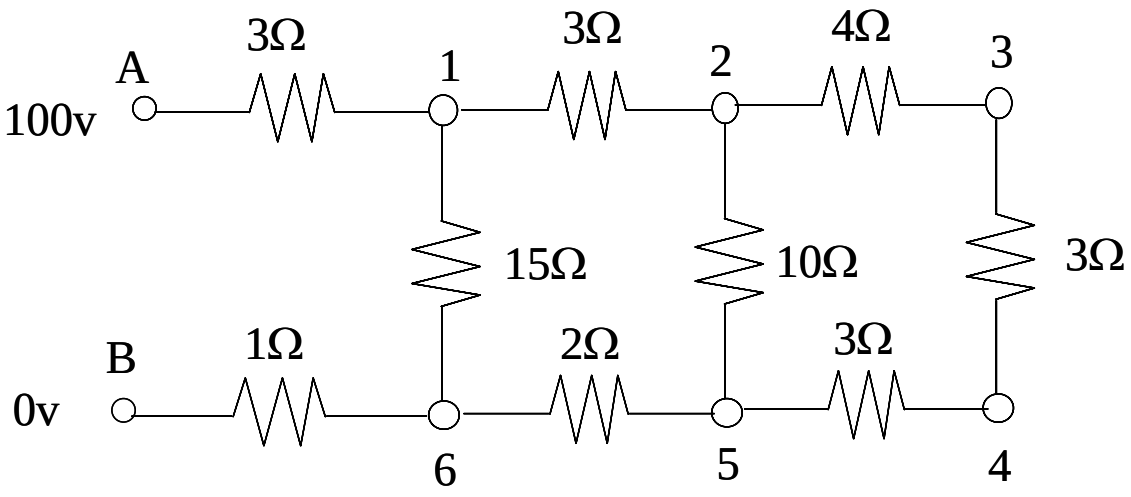
ME 534 COMPUTER-BASED MODELING AND SIMULATION
Instructor: Prof. Cagatay Basdogan



The Ohm's Law states that, I_{pq}, the current flowing from node p to node q in leg pq of an electrical network, is given by

$$I_{pq} = \frac{v_p - v_q}{R_{pq}}$$

where v_p and v_q are the voltages at nodes p and q, respectively, and R_{pq} is the resistance of leg pq. In addition, the Kirchoff's Current Law states that the sum of the currents arriving at each node must be zero. For example, the application of these laws at node 1 in the electrical network shown above leads to

$$I_{A1} + I_{21} + I_{61} = \frac{100 - v_1}{3} + \frac{v_2 - v_1}{3} + \frac{v_6 - v_1}{15} = 0$$

or

$$11v_1 - 5v_2 - v_6 = 500$$

(a) Derive the linear equations whose solutions are the potentials at nodes 1 through 6 in the electrical network shown above.

(b) Write a C/C++ program to calculate the voltages at the nodes using the LU decomposition method discussed in "Numerical Recipes".