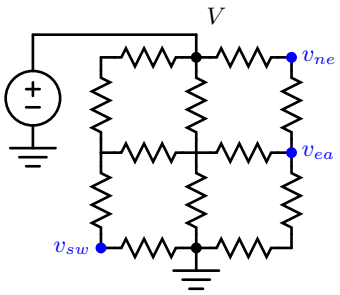
Numerical Analysis

Homework 3. Resistor Networks

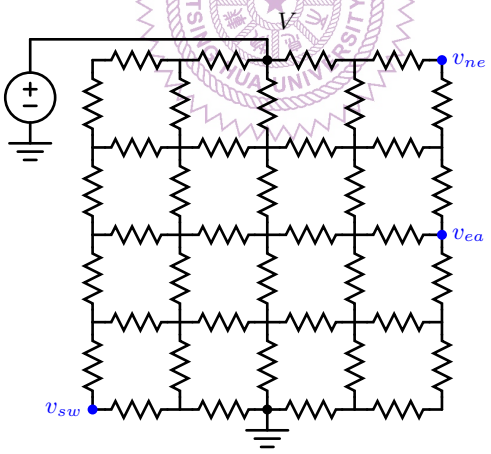
Due: March 21, 2017

Please formulate and solve the following resistor network problems.

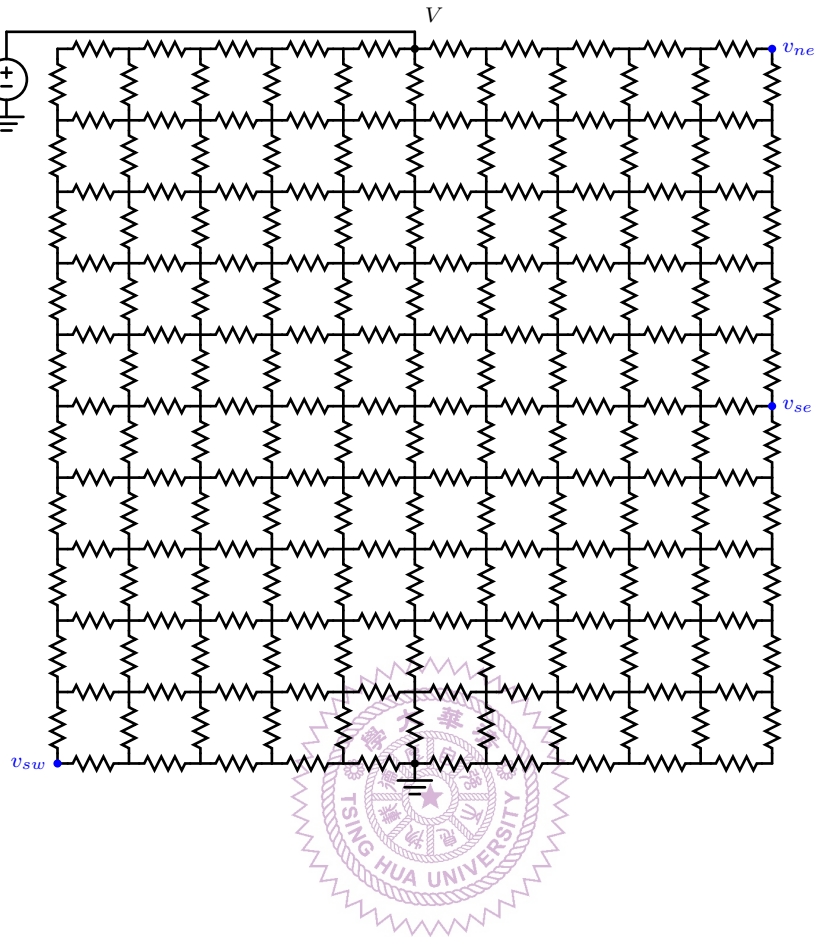
1. Assuming each resistor is 1 KΩ and the voltage, V, is 1 volt, please find the equivalent resistance of the network and the three voltage values, v_{ne}, v_{ea} and v_{sw}.



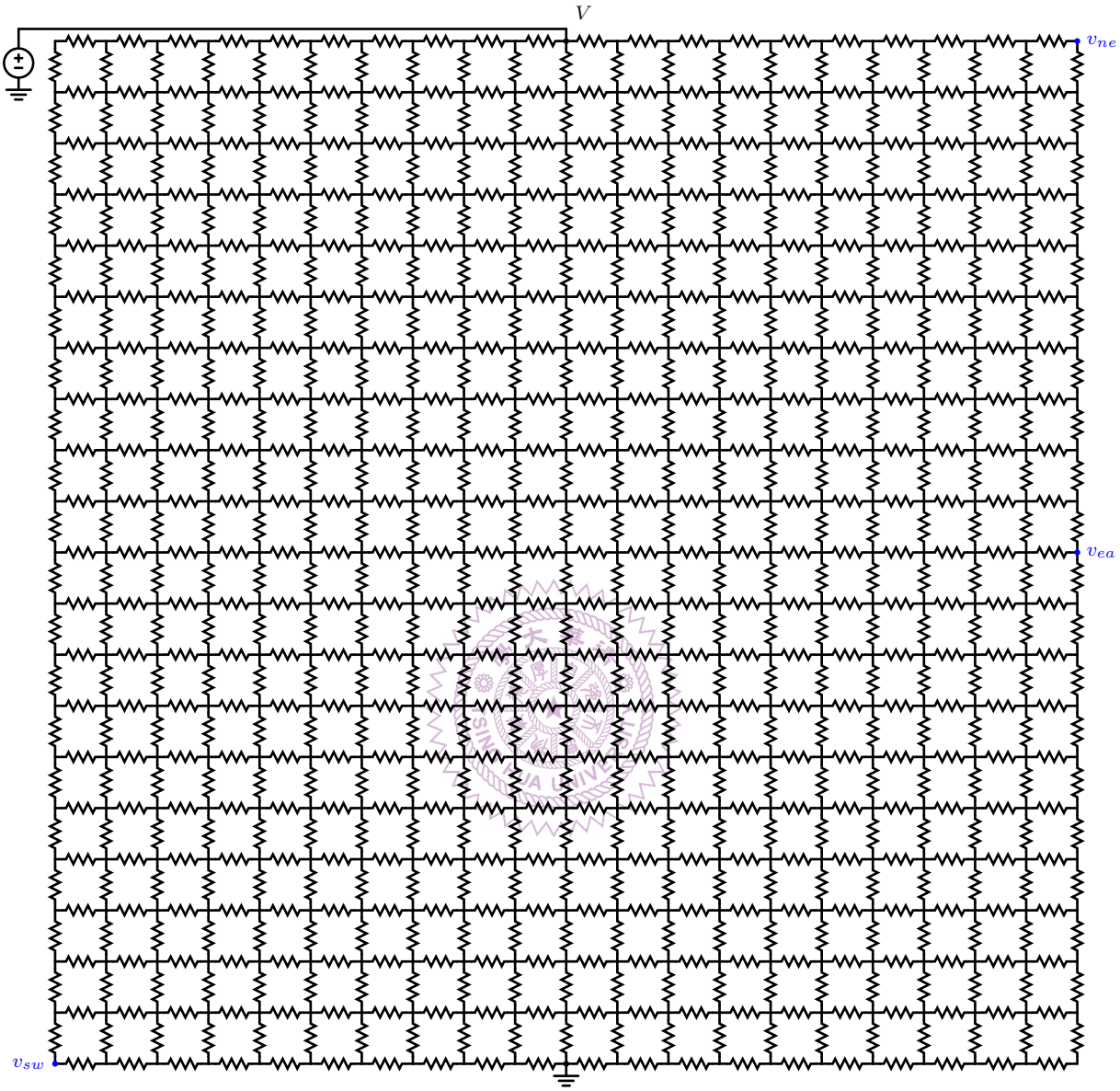
2. Assuming each resistor is 500 Ω and the voltage, V, is 1 volt, please find the equivalent resistance of the network and the three voltage values, v_{ne}, v_{ea} and v_{sw}.



3. Assuming each resistor is 200 Ω and the voltage, V, is 1 volt, please find the equivalent resistance of the network and the three voltage values, v_{ne}, v_{ea} and v_{sw}.



4. Assuming each resistor is 100 Ω and the voltage, V, is 1 volt, please find the equivalent resistance of the network and the three voltage values, v_{ne}, v_{ea} and v_{sw}.



5. Assuming that the resistor mesh has 40 resistors per side and each resistor is 50 Ω. The 1-Volt voltage source is connected to the center of the north side and the center of south side is grounded. v_{ne}, v_{ea} and v_{sw} is the voltage value for the north-east corner, center of east side and south-west corner, respectively. Please find the equivalent resistance and the voltages of those three nodes.

6. Assuming that the resistor mesh has 50 resistors per side and each resistor is 40 Ω. The 1-Volt voltage source is connected to the center of the north side and the center of south side is grounded. v_{ne}, v_{ea} and v_{sw} is the voltage value for the north-east corner, center of east side and south-west corner, respectively. Please find the equivalent resistance and the voltages of those three nodes.

7. Please state your observations after solving all six questions.

Notes.

1. For this homework you need to turn in a C++ program that solves the resistor network problem for question 6. If you program is parametrized then it can solve for all 6 problems using command line arguments. For example,

   ```
   $ ./a.out 10
   ```

   to solve question 3 that each linear dimension has 10 resistors. If your program is not parametrized, then turn in the one that solves question 6. Name your program `hw03.cpp`.

2. A `pdf` file is also needed. Please name this file `hw03a.pdf`.

3. Submit your files on EE workstations. Please use the following command to submit your homework 3.

   ```
   $ ~ee407002/bin/submit hw03 hw03a.pdf hw03.cpp MAT.h MAT.cpp VEC.h VEC.cpp
   ```

   where `hw03` indicates homework 3.

4. Your report should be clearly written such that I can understand it. The writing, including English grammar, is part of the grading criteria.