

ELEN 50 Project 1 (Spring 2020)

Maximum Power Transfer

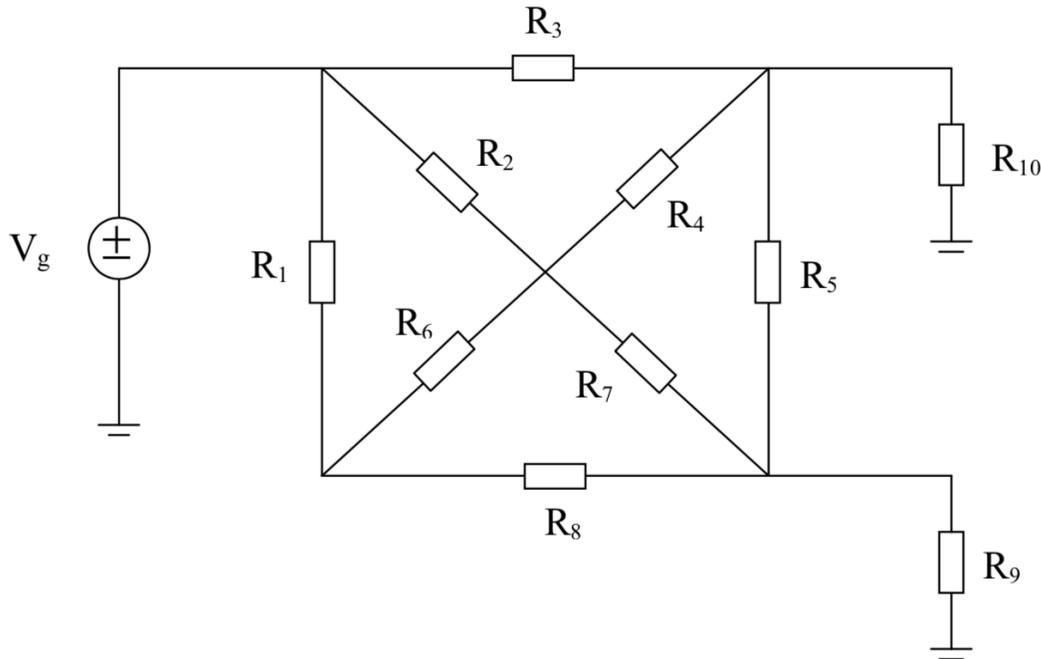


Fig. 1. A power distribution network.

For the circuit above, determine the maximum power p_{\max} delivered to R_9 by finding the Thevenin equivalent circuit as seen by it, using the following methods.

- i) Prelab: Set up 4 node-voltage equations (1 at each essential node except V_g which is known) for calculating the open-circuit voltage v_{oc} , and 3 node-voltage equations for calculating the short-circuit current i_{sc} .
- ii) Generate a MATLAB program to solve these two sets of equations to obtain R_{Th} during the first of two sessions for this project.
- iii) Simplify the circuit by reducing to 2 essential nodes excluding the one at V_g . Using convenient resistor values, compute v_{oc} , i_{sc} , R_{Th} , and p_{\max} . This part will be carried out during the first session.
- iv) In the second session, run your MATLAB program and verify that the solution obtained using it (for the same resistor values) agrees with that from part iii).
- v) Build the circuits for solving v_{oc} , i_{sc} , and R_{Th} using Multisim and compare your results with those from part ii) and with your MATLAB program.