

CE 4333 – Practical Computational Hydraulics in R Exercise 8

Purpose

Apply the Newton-Raphson technique to compute flows and heads in a pipe network.

Exercises

1. Build a script that includes a pump that supplies the network at the upper left corner and determine the flow distribution in Figure 1.

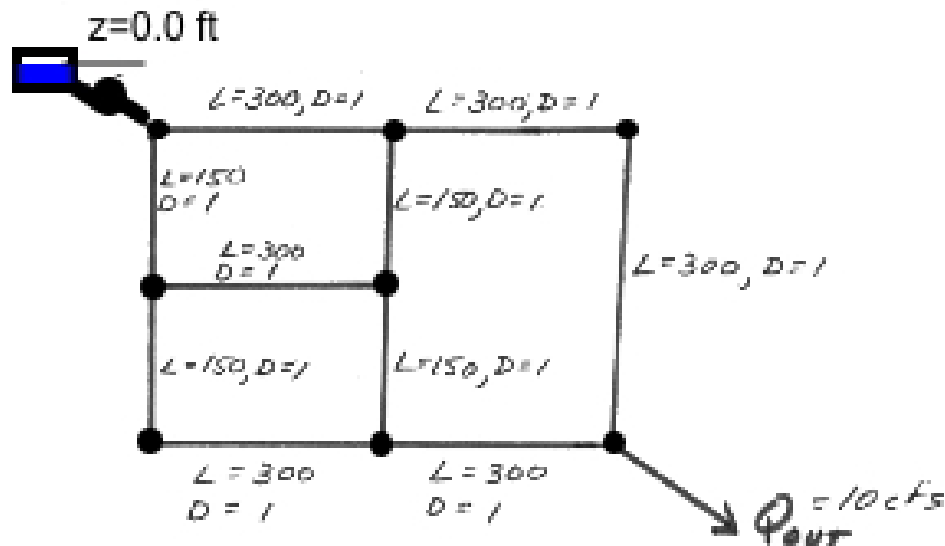


Figure 1: Pipe network for illustrative example with supply and demands identified. Pipe lengths (in feet) and diameters (in feet) are also depicted.

The supply to the upper left corner node is through a pump with the following characteristic curve

$$h_p = 318.11 - 0.25 \times Q^{1.86} \quad (1)$$

The pump supplies from a reservoir with total head of 0.0 feet.

The elevation of each node is 200 feet.

Prepare and submit:

- (a) An analysis showing the development of the node-arc incidence matrix based on your assumed flow directions, node naming convention, and pipe naming convention;
- (b) The input file you constructed to provide the simulation values to your script;
- (c) A screen capture (or output file) showing the results;
- (d) The pumping rate of the pump;
- (e) The total heads at each node; and
- (f) The pressure at each node in pounds per square inch.