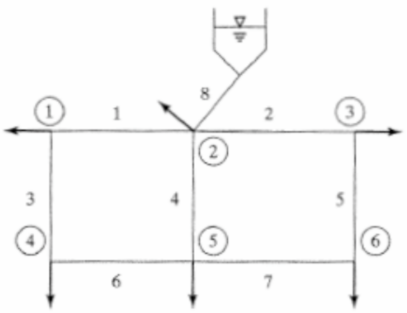
CE 3372 Exercise Set 3 – Solution Sketch

1) Use EPANET to compute the discharge in each pipe and the pressure at each junction node for the 8-pipe system shown in Figure 1.



Pipe Data

Pipe no.	Length m	Length ft	Diameter mm	Diameter in.	Friction factor
1	1,220	4,000	254	10	0.024
2	1,829	6,000	254	10	0.024
3	1,829	6,000	305	12	0.022
4	1,982	6,500	610	24	0.018
5	2,134	7,000	254	10	0.024
6	915	3,000	457	18	0.020
7	1,524	5,000	254	10	0.024
8	91	300	305	12	0.022

Junction Data

Junction node	Ground elevation m	Ground elevation ft	Demand ℓps	Demand gpm
1	51.8	170	31.5	500
2	54.9	180	31.5	500
3	50.3	165	31.5	500
4	47.3	155	94.6	1,500
5	45.7	150	63.1	1,000
6	44.2	145	94.6	1,500

Figure 1: Network and Data for Problem 1

Figure 1. Copy of Figure 1 from Problem Statement

The water surface elevation in the storage tank is 315.0 ft. Prepare your solution using EPA-NET. Report your results in U.S. Customary units. Include a screen capture of the working simulation and the EPANET generated summary report.

Explain how you used the friction factors[1]

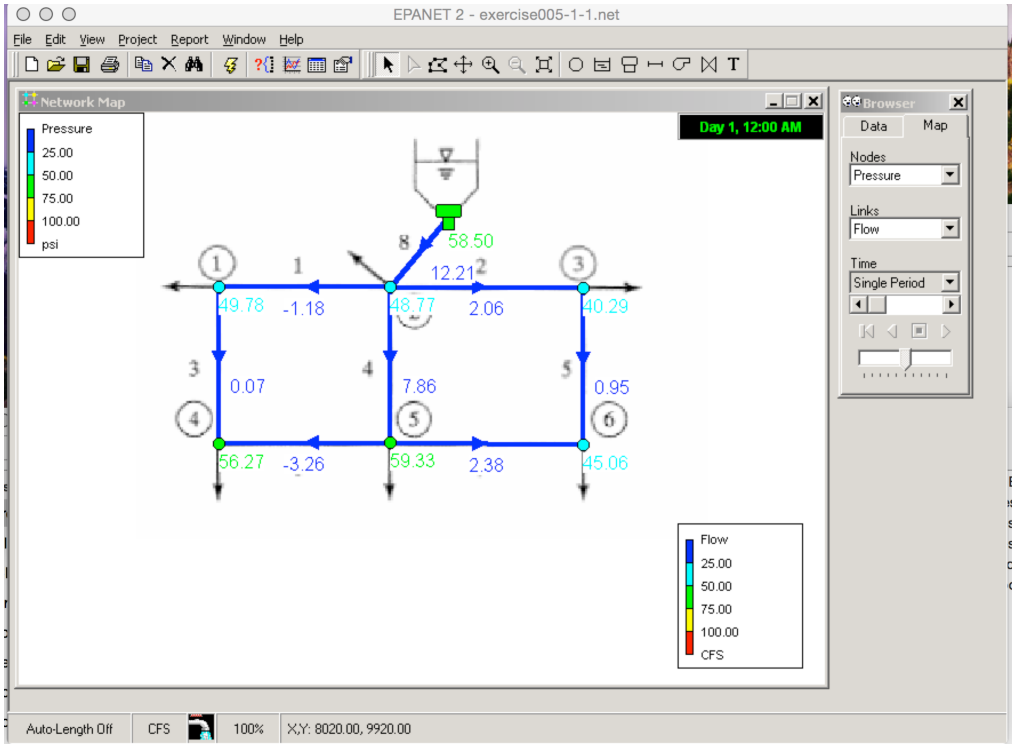


Figure 2. Screen Capture Completed EPANET simulation showing node pressures in pounds per square inch, and pipe discharge in cubic feet per second.

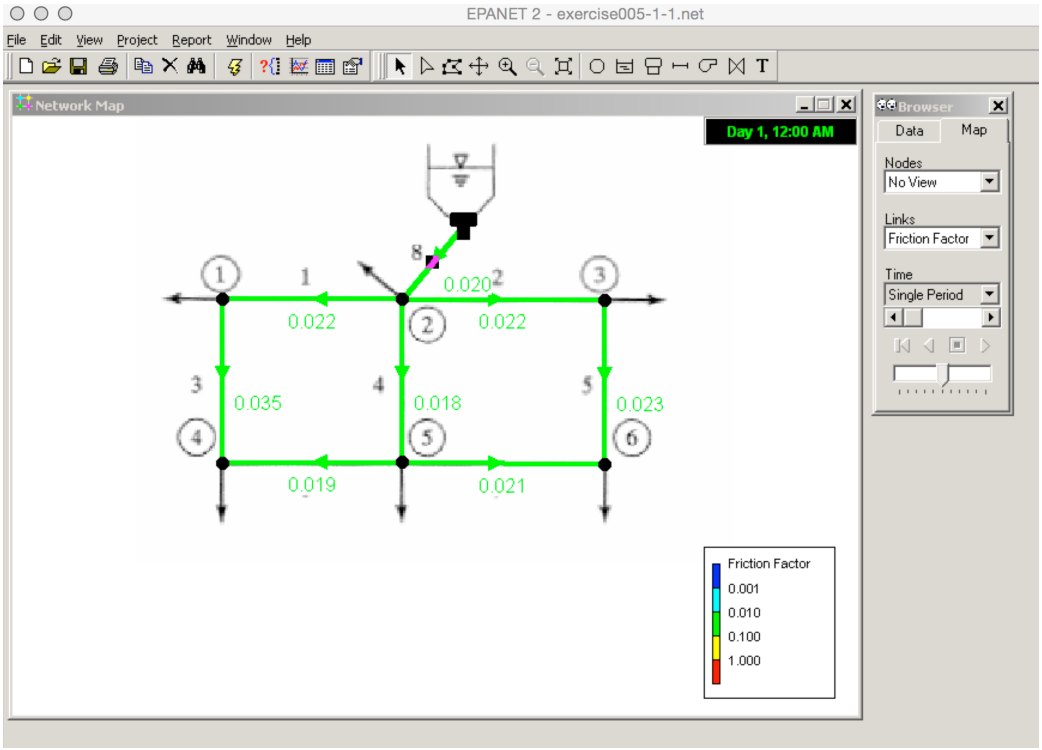
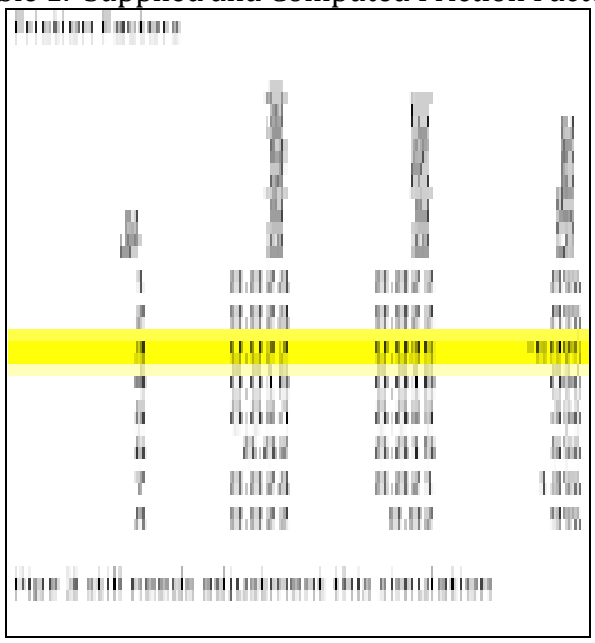


Figure 3. Screen capture of EPANET simulation showing computed friction factors for each pipe.

Friction factors supplied in the problem statement were matched (as best as possible) by adjusting roughness height in EPANET then running the simulation. Table 1 below is a listing of the supplied values and computed values.

Table 1. Supplied and Computed Friction Factors



Summary Report (Generated by EPANET)

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  ******************************************************************
  *                            E P A N E T                         *
  *                     Hydraulic and Water Quality                *
  *                     Analysis for Pipe Networks                 *
  *                           Version 2.0                          *
  ******************************************************************

  Input File: exercise005-1-1.net

  Link - Node Table:

  ------------------------------------------------------------------

  Link            Start           End                 Length  Diameter

  ID              Node            Node                    ft        in
  ------------------------------------------------------------------

  1               2               3                     4000        10
  2               3               4                     6000        10
  3               2               5                     6000        12
  4               3               6                     6500        24
  5               4               7                     7000        10
  6               5               6                     3000        18
  7               6               7                     5000        10
  8               9               3                      300        12

  Node Results:
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Node ID	Demand CFS	Head ft	Pressure psi	Quality	
2	1.11	284.88	49.78	0.00	
3	1.11	292.57	48.77	0.00	
4	1.11	258.00	40.29	0.00	
5	3.33	284.86	56.27	0.00	
6	2.22	286.92	59.33	0.00	
7	3.33	249.00	45.06	0.00	
9	-12.21	315.00	58.50	0.00	Tank

Link Results:

Link ID	Flow CFS	Velocity fps	Unit Headloss ft/Kft	Status
1	-1.18	2.15	1.92	Open
2	2.06	3.79	5.76	Open
3	0.07	0.08	0.00	Open
4	7.86	2.50	0.87	Open
5	0.95	1.75	1.29	Open
6	-3.26	1.85	0.69	Open
7	2.38	4.36	7.58	Open
8	12.21	15.55	74.78	Open