

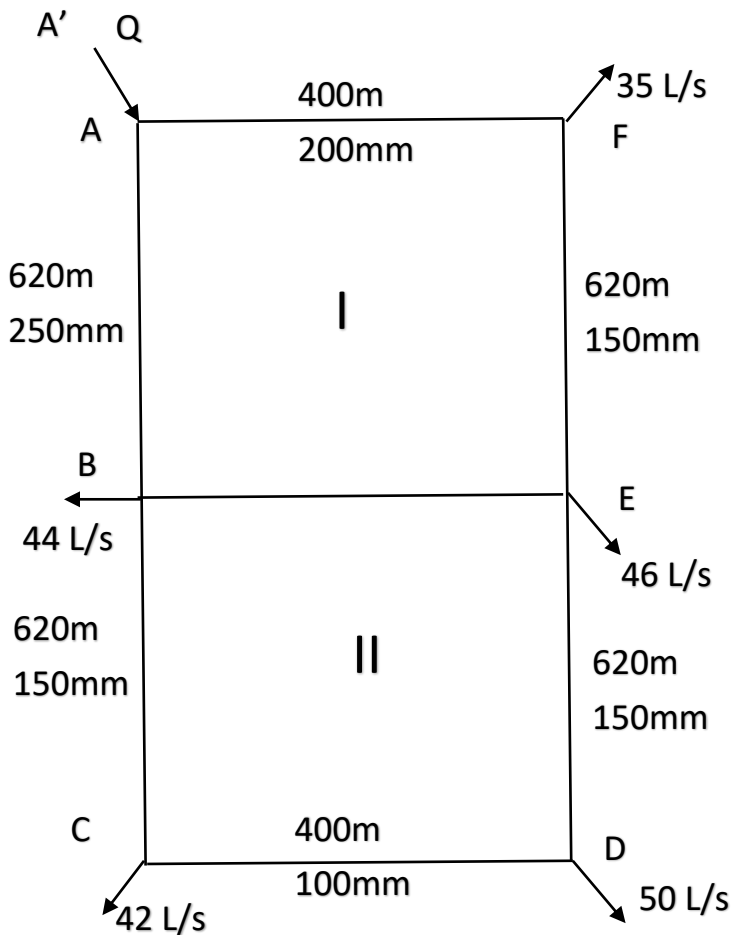
Question 1: (50 points)

The following water network contains two loops and nodes with different elevations as shown in the table below. Assume all pipes have friction factor of 0.0163 and neglecting the minor loses in the pipes, determine:

- A. The exact flows in the pipes using manual calculations and EPANET.
- B. The pressure heads at the nodes if the minimum pressure in any node should not be less than 25 m.
- C. The power of pump to be installed on the line AA'

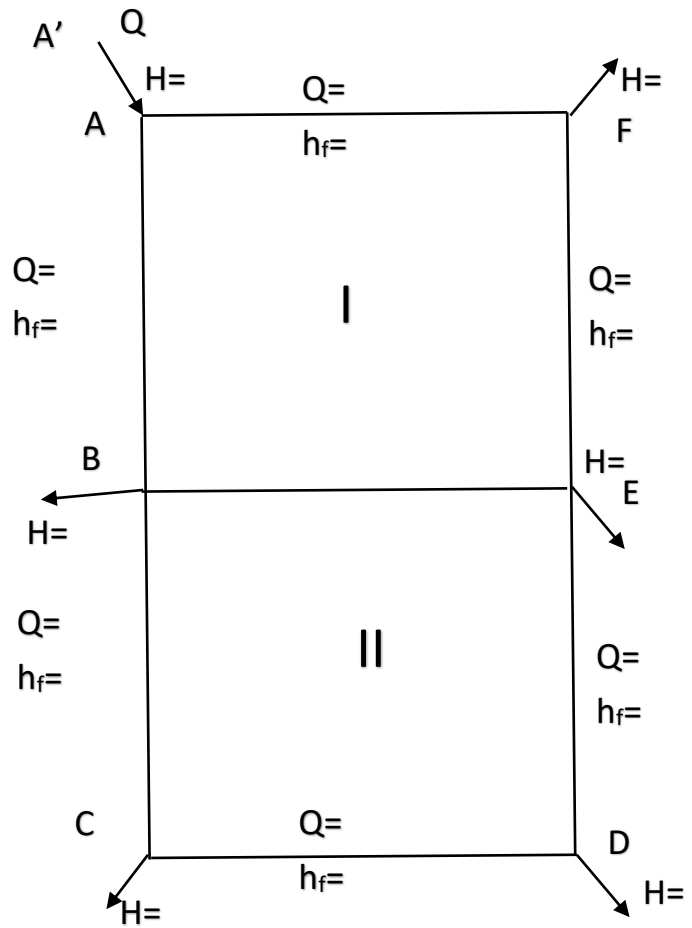
Elevation of pipe nodes are as follows:

Node	Elevation
A	132
B	123
C	120
D	121
E	125
F	118



Summarize your answer in the table and the figure below.

Pipe	Q L/s	V m/s	H _f m
AF			
FE			
EB			
BA			
ED			
DC			
CB			



Question 2: (25 points)

Given the following average hourly demand rates in m³/hr, find using the S-Curve:

Time	m ³ /hr
12.00	212
1.00	189
2.00	188
3.00	166
4.00	189
5.00	214
6.00	507
7.00	916
8.00	1064
9.00	1143
10.00	1190
11.00	1212
12.00	1257
13.00	1248
14.00	1241
15.00	1257
16.00	1302
17.00	1400
18.00	1825
19.00	1755
20.00	966
21.00	280
22.00	257
23.00	234
24.00	212

- (a) The required storage for uniform 24 hr pumping rate, and
(b) The required storage for uniform 12 hr pumping rate (7:00-19:00)

Question 3: (15 points)

If the water to be pumped from a lower to an upper reservoir through AA' line (250-mm diameter) in question 1 has a temperature of 20°C, the pump is to be located 2.0 m above the water surface in the source reservoir, the length of the pipeline between the source reservoir and the suction side of the pump is 4.5 m, the pipe intake loss coefficient is 0.1, the friction factor is 0.0037, the NPSH Required for the pump is 3.66 m as provided by manufacturer, draw the system of the pump and assess the adequacy of the pump location.

Question 4: (15 points)

A. Which processes in wastewater treatment takes place in the presence of oxygen?

- (a) Dehydrogenation of substrate which followed by transfer of hydrogen, or election, to an ultimate acceptor.
- (b) Nitrification
- (c) Denitrification
- (d) Release of hydrogen sulphide phosphate from reduction of sulphate
- (e) Formation of ferric iron from ferrous iron

B. What are the biological growth types in wastewater treatment?