FINAL EXAM CE439

Water Supply and Sanitation

Assume any missing data

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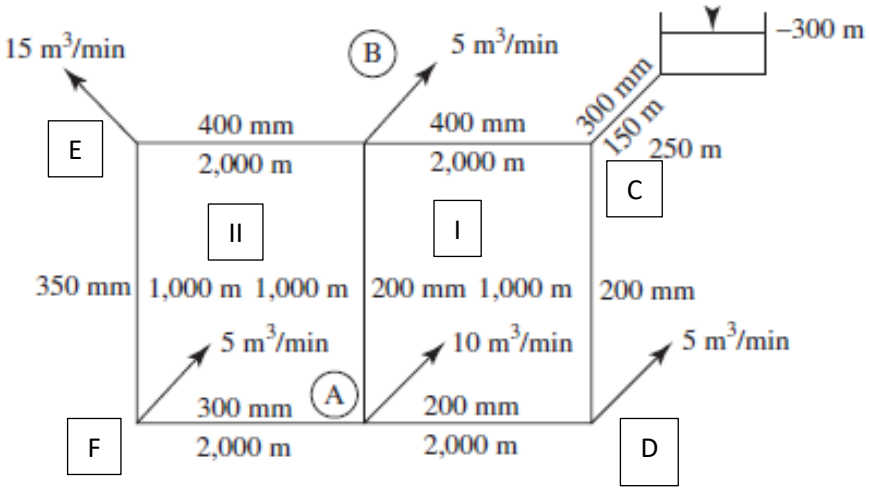
Wednesday, 16/06/2021

Time: 11:00-13:00

Question 1: (50 points)

Using Hardy cross method, perform a hydraulic analysis to determine the exact flow in each pipe of the skeletonized system shown and the pressure head at each junction. The flow rate shown is the fire demand plus the domestic flow.

Using EPANET, determine the pressure at all junctions in the system shown. Is the pressure at A adequate for fire supply? Assume that the elevations at all of the junctions are the same.



Consider the following loops and sequence:

Loop I:

CD

DA

AB

BC

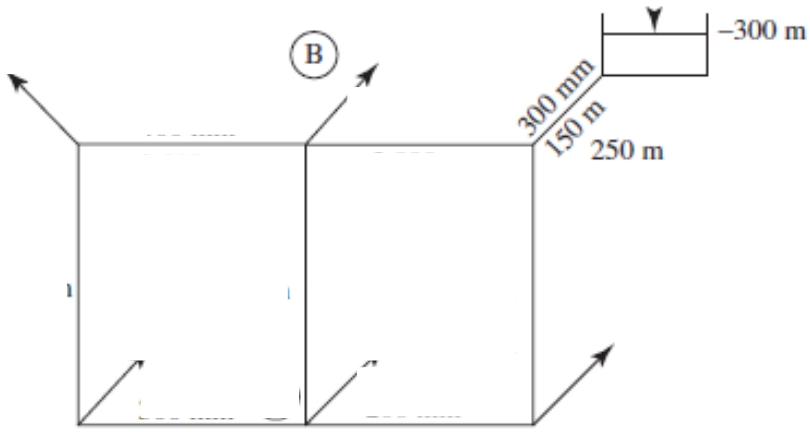
Loop II:

BA

AF

FE

EB



Question 2: (15 points)

A pump intake is located 0.6 m above the water surface in a wet well located at an elevation of 1,000 m above sea level. The water temperature is 10^{o}C. The pump intake friction head losses amount to 0.015 m. The selected pump requires a NPSH of 1.0 m. Does the design of the wet well provide $NPSH_R$?

Question 3: (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?

C. Compare the conversion of energy stored in substrate in anaerobic and aerobic metabolisms.

D. What are the four water related diseases? Give examples of at least two diseases for each one.

E. Describe the metabolism processes of various organic compounds by hetrotophic bacteria

Question 4: (20 points)

Given the following average demand rates in m^3/minute, find using the S-Curve:

(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)

Time	m^3/minute				
12.00	4				
1.00	3				
2.00	3				
3.00	3				
4.00	3				
5.00	4				
6.00	9				
7.00	16				
8.00	18				
9.00	19				
10.00	20				
11.00	21				
12.00	21				
13.00	21				
14.00	21				
15.00	21				
16.00	22				
17.00	24				
18.00	31				
19.00	30				
20.00	16				
21.00	5				
22.00	5				
23.00	4				
24.00	4				