



Course no :

Student No:

Course Title:

Final Exam

Student Name:

Sanitary Engineering

Theoretical Exam

Exam Time: 2.0 Hours

2nd Semester 2013-2014

Date: 20/05/2014 12:00

Questions: two

Total Grade: 60

Answer All Questions

Open Book: No

Using Computer: No

Using Calculator: yes

First Question

Don't forget, manage your time!!!

(30/60)

Discus the following terms:

(8 pts)

Water reuse

Cavitations

pipe corrosion

Gabions.

Answer the following question:

(22 pts)

1. Draw the water cycle and explain the phenomena in details? Define the Causing by each one?
2. What are the main criteria to choose the kind of collection system, Discus?
3. What are the important hydrodynamic considerations in sewer design? Explain?
4. What are the main kinds of pipe materials and the Factors effecting the selection of them?
5. Identify the loads and pressures kind acting in the pipe in water process?
6. Why manholes are important? How can the distance between them estimated?
7. Explain the energetic aspect in the processing of evaporation and condensation?
8. How affects combined system waste water treatment processes? Discus?
9. Account the main steps of Decision making? Explain shortly?

Second Question

(30/60)

1) Use the nomogram and partial flow curves to design two pipes, use the data in the table

(23 pts)

Pipe	Q_p [m ³ /s]	d [mm]	D [mm]
1	0.2	400	800
2	0.6	450	500

- a) Find the Velocity and the slope of each pipe required, if $n = 0.04$.
- b) Prove the hydrodynamic validity for both cases and Suggest possible solutions if need? Explain your Results and Decisions you make?
- c) Find the kind of flow, assume fully flow, $\rho = 990 \text{ kg/m}^3$, $\nu = 0.38 \text{Ns/m}^2$
- d) Calculate the backfill load on the pipes by the following given information:
Backfill depth (H) = 3.3 m, Trench width at the top of the pipe is 1.1 m
Backfill is saturated clay, $\rho = 1720 \text{ kg/m}^3$
- e) Calculate the truck load on each pipe if the backfill cover is 1.1 m, the Impact factor is 1.0.

2) The population number in a municipality is 280000 inhabitants,

(7 pts)

Design a wastewater pump station to lead the wastewater in the collection system,

Consider the wet part = 60% and the water demand of 80l/c.d. Express the dimension of rising and transport pipe in inch.

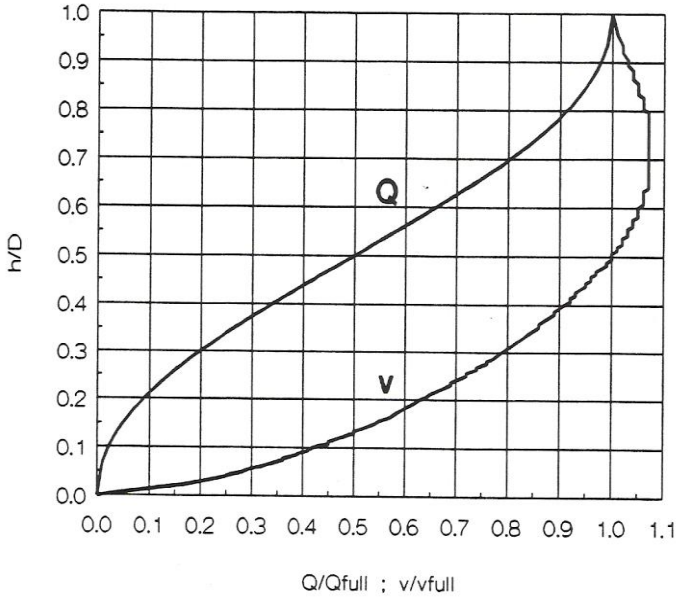
**End of Questions
Good Luck**



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Pipe Diameter, millimetres	Height of Filling Above Pipe (metres)										
	0.15	0.20	0.46	0.61	0.76	0.91	1.07	1.22	1.52	1.83	
305	70.8	39.9	22.5	13.9	8.4	5.3	4.6	3.5	2.5	0.7	305
381	86.4	48.5	27.3	17.0	10.2	6.4	5.2	4.2	3.0	0.8	381
457		57.3	32.1	20.0	12.0	7.6	6.6	5.0	3.5	1.0	457
533		65.7	36.9	23.1	13.9	8.7	7.6	5.7	4.1	1.1	533
610			41.7	26.1	15.7	9.9	8.6	6.5	4.6	1.3	610
686			45.2	29.2	17.5	11.1	9.6	7.2	5.2	1.4	686
762				32.2	19.4	12.2	10.7	8.0	5.7	1.6	762
838				34.6	21.2	13.4	11.7	8.7	6.2	1.7	838
914					23.1	14.5	12.7	9.5	6.8	1.9	914
1067					24.5	16.9	14.7	11.0	7.8	2.1	1067
1219						17.8	16.7	12.5	8.9	2.5	1219
1372							17.3	14.0	10.0	2.7	1372
1524								14.5	11.1	3.0	1524
1676									12.1	3.3	1676
1829									12.5	3.6	1829
1981										3.9	1981
2134										4.0	2134

Source: Concrete Pipe Design Manual, American Concrete Pipe Association, SI units by author

