



Course no :

Student No:

Course Title:

**Midterm Exam
Theoretical Exam**

Student Name:

Sanitary Engineering

Exam Time: 1.5 Hours

2nd Semester 2013-2014

Date: 24/03/2014 11:00

Questions: Three

Total Grade: 20

Answer All Questions

Open Book: No

Using Computer: No

Using Calculator: yes

First Question

Don't forget, manage your time!!!

(4/20)

Describe the following phenomena or definitions: (each 1 pt)

- Pipe corrosion ■ Hydraulic Radius ■ Liquid gas flow regime ■ Water hammer

Second Question

(5/20)

Answer the following questions (each 1 pt)

1. What are types of Collection systems? Explain the advantages and the disadvantages? What is the main criteria to choose the kind of collection system, discuss?
2. By the estimation of Run Off coefficient we use the higher value, when? Why?
3. Why the Velocity is an important consideration in sewer design? Explain?
4. Account the Methods to prevent the corrosion in pipe systems? Explain the cheapest one?
5. What are the main Impacts of storm water on the WWTP - processing?

Third Question

(11/20)

1) Given are the following data for gravity pipe serving in a community of 500.000 inhabitants (7 pts)

Pipe length	95 km
$Q_{avg,ww}$	4 l/c.h
Infiltration rate	1000 l/km.h
Inflow	20 l/s

- a) Find Q_{max} , Q_{des} and Q_{min}
- b) Find the pipe dimension and the Velocities by using the nomogram?
Given: $S = 1.2\%$, $n = 0.04$
- c) Check the hydrodynamic Validity? Discus, your Results?

2) For flow rate $5400 \text{ m}^3 / \text{d}$ in a pipe line $L = 1.6 \text{ km}$, (4 pts)

Find the needed amount of NaNO_3 to prevent Corrosion, Consider

The flowed medium is domestic inorganic Waste water with a $C_{IC} = 30 \text{ mg/l}$ and $C_{TOC} = 200 \text{ mg/l}$.

Take decision for all logic assumptions you need.

**End of Questions
Good Luck**



Nomogram

