Menoufiya University
Faculty of Engineering Shebin El-Kom
Civil Eng. Department

Date of Exam: 28/05/2018

Minufiya University

Subject: Planning Water & Sanitation
Code: CVE 525
Year: Graduate Diploma
Time Allowed: 3 hours
Total Marks: 100

**Answer all the following Questions** (assume any missing data)

*Marks*

## *Question (1)* [20]

a) Define tertiary wastewater treatment and its objectives..... (5)

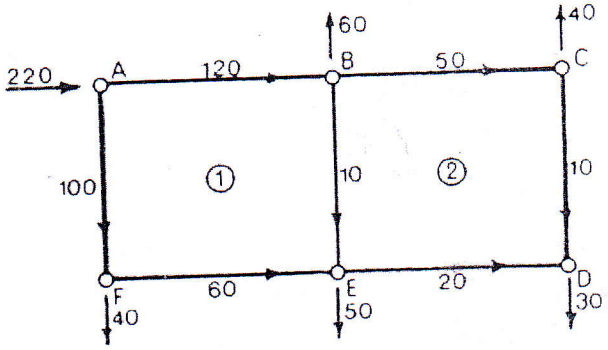
b) Differentiate Nitrification from Denitrification.....(5)

c) Differentiate disinfection from sterilization.....(5)

d) What are the most common disinfectants?.....(5)

## *Question (2)* [30]

Given the network shown in Fig.1, the inflow at A (L/s), and outflows at B, C, D, E and F (L/s). Using Hardy Cross method, find the flows in the individual pipes comprising the network (only two trials are required) .....(30)




| Pipe | AB | BC | CD | DE | EF | AF | BE |
|---|---|---|---|---|---|---|---|
| Length (m) | 600 | 600 | 200 | 600 | 600 | 200 | 200 |
| Diameter (mm) | 250 | 150 | 100 | 150 | 150 | 200 | 100 |

**Fig. 1**

## *Question (3)* [25]

(a) Mention five different methods for prediction of future population ..... (5)

(b) The following table shows the population in millions of a country during the years 1950 – 2010, in ten years intervals. .....(20)

| Year | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 |
|---|---|---|---|---|---|---|---|
| Population (million) | 23.2 | 31.4 | 39.8 | 50.2 | 62.9 | 76 | 92 |

1) Find the equation of the least square parabola fitting the data.

2) Estimate the population in 2050 & 2070

Knowing that : $\Sigma Y = aN + b\Sigma X + c\Sigma X^2$

$\Sigma XY = a\Sigma X + b\Sigma X^2 + c\Sigma X^3$

$\Sigma X^2Y = a\Sigma X^2 + b\Sigma X^3 + c\Sigma X^4$

## *Question (4)* [25]

a) Draw Oxygen Sag Curve showing all components and parameters. ..... (10)

b) Wastewater discharges to a river resulting initial BOD = 12.0 mg/L and DO = 7.0 mg/L. Calculate the critical time and location downstream for minimum DO? ..... (15)

Knowing that:

- Deoxygenation constant = 0.2 /day
- Average flow speed = 0.3 m/s
- Average river depth = 3.0 m
- Saturated DO = 9.1 mg/L
- Neglect temperature correction.

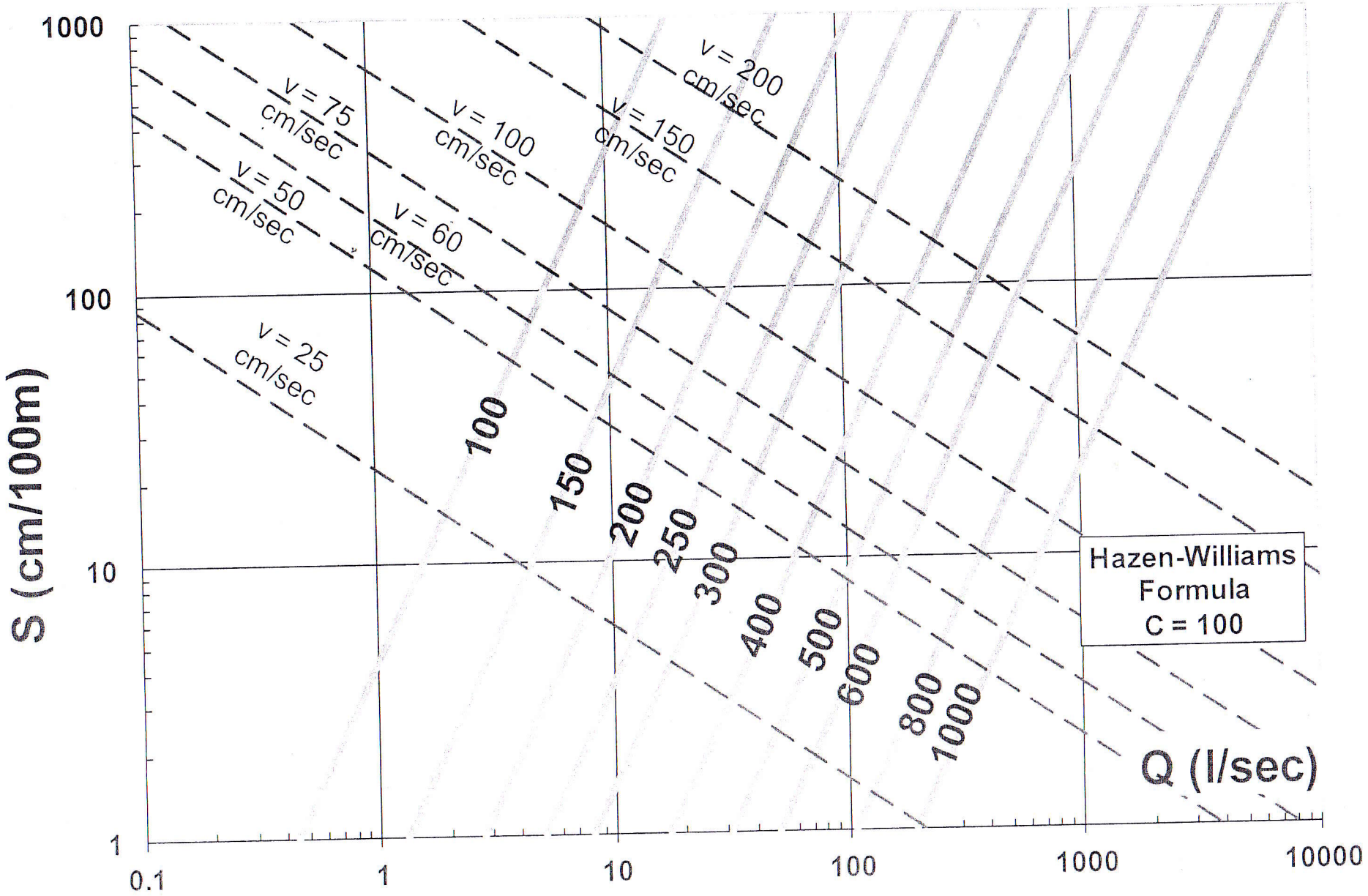
Use the following formulas:

$$K_2 = \frac{3.9\,V^{1/2}}{H^{3/2}}$$

$$t_c = \frac{1}{K2-K1}\ln\left\{\frac{K2}{K1}\left(1-\frac{Do\,(K2-K1)}{K1\,Lo}\right)\right\}$$

**End of Exam - Good luck**

| This exam measures the following ILOs | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Question Number** | Q1 | Q2-a | Q2-b | Q3-a | Q4-a | Q2 | Q3-b | Q4-a | | | Q2 | Q3-b | Q4-b | | |
| **Skills** | a1-1 | a1-2 | a1-1 | a1-2 | a1-2 | b2-1 | b2-1 | b2-1 | | | c1-1 | c1-1 | c1-1 | | |
| | Knowledge &Understanding Skills | | | | | Intellectual Skills | | | | | Professional Skills | | | | |


1000
100
10
1
S (cm/100m)
0.1
1
10
100
1000
10000
Q (l/sec)
v = 200 cm/sec
v = 150 cm/sec
v = 100 cm/sec
v = 75 cm/sec
v = 60 cm/sec
v = 50 cm/sec
v = 25 cm/sec
100
150
200
250
300
400
500
600
800
1000
Hazen-Williams Formula
C = 100