編號： 140

國立成功大學 108 學年度碩士班招生考試試題

系　　所：環境工程學系

考試科目：衛生工程

考試日期：0223，節次：1

※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Answer the following questions or explain the terms. (20%)

(1) Describe the non-equilibrium equation for the groundwater hydraulics.

(2) What is "cavitation" in pumping and how to minimize it?

(3) Describe breakpoint chlorination.

(4) Describe "crown corrosion" and lists at least two methods to minimize it.

2. For the following waste and river characteristics just upstream from the wastewater outfall, find the minimum downstream DO and distance where the minimum DO occurs. Assume that the river speed is linearly proportional to the flow rate and the temperatures for wastewater and river water are both 20°C. (20%)

Parameter	Wastewater	River
Flow (m^3/s)	0.3	0.9
Ultimate BOD (mg/L)	6.4	7.0
DO (mg/L)	1.0	6.0
k_1 (d^{-1}) @ 20°C	-	0.2
k_2 (d^{-1}) @ 20°C	-	0.37
Speed (m/s)	-	0.60
$DO_{sat.}$ (mg/)	8.0	8.0

3. The flow data for a river is shown below in the table. Assume that the water demand is 380,000 m^3/day. Show if the total water resource in the river could meet the demand and state your reason. If constructing a reservoir is required, what would be the size (m^3)? (15%)

Month	Inflow (I) (m^3/day)
F	640000
M	590000
A	440000
M	160000
J	140000
J	200000
A	300000
S	350000
O	450000
N	490000
D	570000
J	680000

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4. For a positively charged colloid in an electrolyte solution, please draw the distribution of electrolyte ions around the colloid and the surface (electrostatic) potential changes from the colloid surface. Indicate the specific surface potentials. (15%)

5. Calculate the overflow rate and detention time in a primary clarifier with a diameter of 24 m and water depth of 2.3 m for a flow of 10,000 m^3/day. (10%)

6.Calculate the initial head loss for a 0.5 m-deep bed of the filter sand at a filtration rate of 2 $L/m^2 \cdot s$ using a grain sphericity of 0.8 and porosity of 0.3. The size analysis of the sand is shown in the table below. Kinematic viscosity of water is 1.306×10^{-6} m^2/s. (20%)

Cumulative %	**Size (mm)**
100	1
90	0.87
70	0.8
50	0.73
30	0.66
10	0.54
0	0.48

$$\frac{h}{L} = \frac{k\mu}{\rho g} \frac{(1-\varepsilon)^2}{\varepsilon^3} \left(\frac{6}{\Psi d}\right)^2 V$$

$$= \frac{36k\nu}{g} \frac{(1-\varepsilon)^2 V}{\varepsilon^3 \Psi^2 d^2}$$

, where k =5.