題號： 227
科目： 衛生工程
節次： 8

國立臺灣大學 111 學年度碩士班招生考試試題

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1. 蓄水容量為水庫設計之重要參數，請說明如何利用累積流量圖法(Mass curve)決定依水庫的蓄水容量 (15 分)

2. 請說明一輸水系統以抽水機加壓送水時，其經濟管徑如何決定。 (10 分)

3. 一鄉鎮開鑿水井抽取位於非拘限含水層(unconfined aquifer)之地下水做為水源，如下圖所示。該含水層為均質壞土，其含水層厚度(D)為 40 公尺，水利傳導係數(K)為 30 m/day，孔隙率(n)為 0.4，地下水流為水平流向。
   (a) 根據達西定律推導抽水量(Q)和水利傳導係數(K)、影響圈半徑(R)、含水層厚度(D)、抽水井半徑(r)和抽水井水位(d)的關係。 (15 分)
   (b) 開鑿之水井半徑為 0.4 公尺，抽水量為 1500 CMD，抽水後影響半徑為 1000 公尺，此口井中之地下水位洩降(s)為多少？ (10 分)
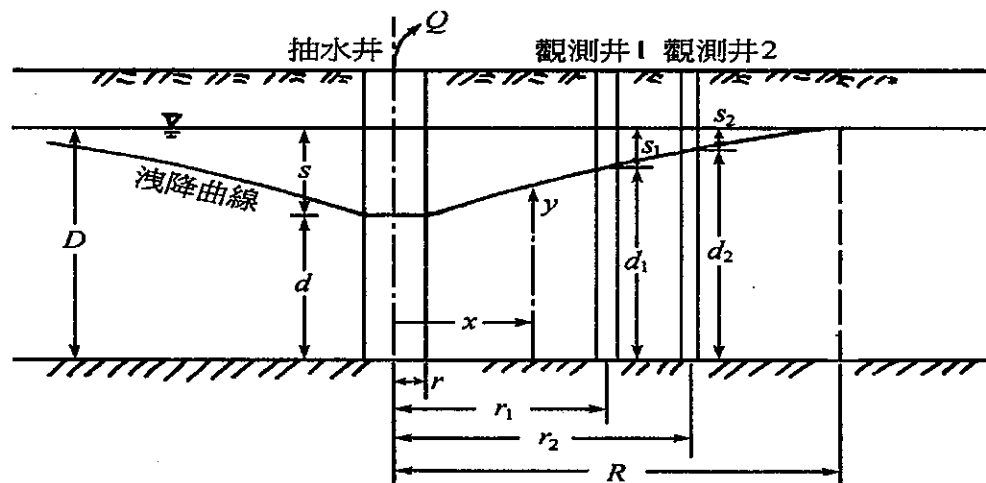
4. Please explain the following terms and their related environmental implications. (15 分)
   (a) Persistent organic pollutants
   (b) Aerobic digestion
   (c) Anaeroxic-Anoxic-Oxic (A^2O) process

5. A drinking water treatment plant uses a rectangular, horizonal-flow sedimentation basin to treat river water with a flow rate of 3800 m^3/day. The rectangular sedimentation basin has a depth of 4 m, width of 6 m, and length of 30 m.
   (a) Estimate the overflow rate of the sedimentation basin. (5 分)
   (b) After storms occur upstream, the river often carries silt particles with a specific gravity of 2.65. By the experimental analysis of batch settling columns, the particle-setting characteristic (i.e., weight fraction an average settling velocity) is shown in the following table. Please calculate the over removal efficiency of the particles. (10 分)

Settling velocity (m/min)	0.030	0.020	0.012	0.008	0.005
Weight fraction removed	0.60	0.50	0.30	0.15	0.03

6. (a) Explain the principles of coagulation in water treatment. (5 分)
   (b) Liquid alum ($Al_2(SO_4)_3 \cdot 14H_2O$: 594 m.w.) is widely used a coagulant for particle destabilization. When alum is added to a water containing alkalinity, the reaction occurs as follows:

   $$Al_2(SO_4)_3 \cdot 14H_2O + 6HCO_3^- \rightarrow 2Al(OH)_3 + 6CO_2 + 18H_2O + 3SO_4^{2-}$$
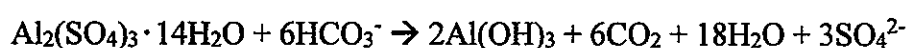
   Estimate the amount of alkalinity (in mg/L as $CaCO_3$) consumed from the addition of 180 mg/L liquid alum. (5 分)

7. Please compare the difference of "suspended growth" and "attached growth" of biological treatment processes. If you are designing a wastewater treatment plant for efficiently removing the nitrogen from domestic wastewaters, which one you will use in the biological process? Briefly explain the reasons. (10 分)

試題隨卷繳回