

**Second Mid-term Exam**  
**Time allowed: 1½ hour**

Student Name: -----

Student Number: -----

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**Question One (20%)**

A small town produces 20,000 m<sup>3</sup>/day of wastewater on the average. The peak flow is 1.75 times the average.

- (a) Design a grit-removal system consisting of two identical chambers 2.0 m deep to process the peak flow. The flow-through velocity is to be controlled at 0.2 m/s by a down stream proportioning weir, and the settling velocity is to be maintained at 0.1 m/s . Determine also the design detention time.

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- (b) Design a primary clarification system with at least two tanks 2.0-m deep provided that the overflow rate should not exceed 70 m<sup>3</sup>/m<sup>2</sup>.day at the peak flow and the detention time should be at least 1.0 hour .

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**Question Two (20%)**

A single-stage trickling filter plant is proposed for treating a municipal wastewater flow of  $4000 \text{ m}^3/\text{d}$  with an average BOD of  $300 \text{ mg/L}$ . Assuming 35% BOD removal in the primary settling tanks, calculate the size required for two 3-m deep filters operating in parallel with a BOD loading of  $500 \text{ g/m}^3 \cdot \text{d}$ .

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**Question Five (20%)**

A completely-mixed aerated lagoon is being considered for pre-treatment of strong industrial wastewater with  $K = 0.7$  per day at  $20\text{ }^{\circ}\text{C}$  using a detention time of 5 days. What is the BOD reduction at  $20\text{ }^{\circ}\text{C}$  (i.e. removal efficiency).

If the wastewater temperature is  $10\text{ }^{\circ}\text{C}$ , compute the detention time required to achieve the same degree of treatment.

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