

1.85 WATER AND WASTEWATER TREATMENT ENGINEERING HOMEWORK 8

Question 1 (5 points)

Design a facultative lagoon for a temperate climate when the flow rate is $3800 \text{ m}^3/\text{d}$ and the BOD5 is 200 mg/L . Use these steps:

- Select a reasonable depth.
- Calculate the surface area based on the BOD5 areal load.
- Calculate the volume and hydraulic detention time.
- Calculate the volumetric loading ($\text{kg BOD}_5/(\text{1000 m}^3\text{-day})$).
- If degradation in a facultative lagoon can be modeled as a first-order process with a degradation rate of 0.2 day^{-1} , what will be the effluent concentration from the lagoon?

Question 2 (5 points)

The aeration tank for a completely mixed aeration process is being sized for a design wastewater flow of $4500 \text{ m}^3/\text{d}$. The influent COD is 150 mg/L . The design effluent COD is 7 mg/L . Recommended design parameters are a sludge age of 10 days and MLVSS of 1400 mg/L . The expected Sludge Volume Index is 100 ml/g . Selection of these values takes into account the anticipated variations in wastewater flows and strengths. The kinetic constants from a bench-scale treatability study are $Y = 0.60 \text{ mg VSS/mg COD}$ and $k_e = 0.06 \text{ per day}$. Calculate:

- the hydraulic residence time and volume of the aeration tank
- the food/microorganism ratio
- the sludge production rate
- the sludge recycle ratio
- the oxygen requirement.