1. A completely mixed activated sludge process at Can Wastewater Treatment Plant in Canakkale, treating a municipal wastewater, has a primary effluent BOD5 of 145 mg/L. The design MLSS is 3500 mg/L, and the MLVSS is 75 % of the MLSS. The plant permit is for an effluent BOD5 of 20 mg/L and 25 mg/L TSS. The effluent TSS has a BOD5 of 0.5 mg BOD5/mg TSS. If µmax = 3 d-1, KS = 60 mg/L; Y = 0.6, kd = 0.065 d-1 and the influent average flow is 20 000 m3/d. Determine aeration time (h)
2. ( 5 p) Determine mean cell residence time (d)
3. (5 p) Determine hydraulic retention time (h)
4. (5 p) Determine the reactor basin volume (m3)
5. (5 p) Determine the sludge production rate, Px (kg/d)
6. (5 p) Determine return sludge rate (Qr) If the sludge withdrawal is accomplished from the aeration basin, and the return line has MLSS of 0.75%.
7. (5 p) Determine return sludge rate (Qr) If the sludge withdrawal is accomplished from the return line, and the return line has MLSS of 0.75%.
8. (5 p) Determine daily oxygen consumption (kg O2/d)
9. Two secondary settling tanks at Can Wastewater Treatment Plant are 30 m in diameter and 4 m deep at the side wall. The effluent weir is a single launder set on the tank wall.
10. (5 p) Evaluate the overflow rate (m2/m2d)
11. (5 p) Solids loading rate (kg/m2d)
12. (5 p) The total weir length (m)
13. (5 p) The weir loading rate (m3/md)
14. An oxidation pond having a surface area of 90 000 m2 is loaded with a waste flow of 500 m3/d containing 200 kg of BOD5. The pond has a depth of 1.2 m.
15. (10 p) Determine BOD5 loading rate (kg(Ha.d)
16. (10 p) Determine hydraulic retention time (d)

4) (10 p) A single stage super-rate trickling filter is to be designed for a population of 15 000 persons. Pertinent data are average influent flow = 350 L/cap-d, influent BOD5 = 250 mg/L, primary clarifier removes 33 % of the BOD5, effluent BOD5 = 15 mg/L, filter depth = 6 m, and recycle ratio = 2. Pilot-plant studies using a synthetic plastic packing material show a removal constant K = 2.26 at 20 oC when the depth is in meters, the hydraulic loading is in m3/m2-d, and the constant n = 0.5. the winter wastewater temperature = 10 oC. If two filters are used in parallel, determine the filter diameter in meters.

5) A completely mixed aerated lagoon wastewater treatment is to be designed for a municipal wastewater. The design population is 5200 persons, and the aerated lagoon is to provide secondary treatment. Pertinent data are: flow = 380 L/cap-d, influent BOD5 = 200 mg/L; effluent BOD5 = 20 mg/L, K = 2.1 d-1oxygen required 1.6 kg O2/kg BOD5 applied to the lagoons, and the primary clarifier removes 33 % of the influent BOD5.

a) (3 p) Determine the required aeration time (h)

b) (3 p) Determine the total lagoon volume (m3)

c)(3 p) Determine the lagoon dimensions if two lagoons in parallel are used, the length to width ratio is 2:1, and the depth is 3 m.

d) (3 p) Determine the oxygen requirements and power requirements if the mechanical aerators furnish 0.949 kg/kW-h.

e) (3 p) Determine the mixing power intensity, Is it adequate if the power level required by artificial aeration should be at least 3.95 kW/1000 m3 wastewater treated ?