

The Assam Royal Global University, Guwahati
Royal School Of Engineering & Technology
B.Tech. 6th Semester
Semester End Examination, July 2021
Course Title : Physico-chemical Processes for Water & Wastewater Treatment
(Elective III)
Course Code : CEE022D605

Time: 3 Hours

Maximum Marks: 70

Note: Attempt all questions as per instructions given.

The figures in the right-hand margin indicate marks.

Section – A

1. Attempt all questions. 2 x 8
- a. What is screening?
 - b. What are the assumptions of Stokes law?
 - c. What is mechanical straining?
 - d. What is air binding in rapid sand filter?
 - e. What is Break point chlorination?
 - f. What is Salination process?
 - g. Two sample of water A & B have pH value of 3.2 and 5.7. How many times more acidic sample A is then sample B
 - h. What is adsorption?
2. Attempt any two of the following: 6 x 2
- a. An ideal horizontal flow settling basin is 3m deep having surface area 900m² Water flows at the rate of 8000 m³/d, at water temperature 20°C ($\mu = 10^{-3}$ kg/m.s) and ($\rho = 1000$ kg/m³). Assuming Stokes law to be valid. What is the proportion (percentage) of spherical sand particles (0.01 mm in diameter with specific gravity 2.65), that will be removed?
 - b. Consider a primary sedimentation tank (PST) in a water treatment plant with surface Overflow Rate (SOR) of 40 m³/m²/d. Find the diameter in μm of the spherical particle which will have 90 percent theoretical removal efficiency in this tank. Assume that settling velocity of the particles in water is described by Stokes's Law. Given Density of water = 1000 kg/m³; Density of particle = 2650 kg/m³; $g = 9.81$ m/s² ; Kinematic viscosity of water (ν) = 1.10×10^{-6} m²/s
 - c. What are the limitations of Aeration? Explain
3. Attempt any two of the following: 7 x 2
- a. A city has a population of 100,000 with an average rate of demand of 160 litres perday. Find the area of rapid sand filter.
 - b. Write short notes:
 - i. Pressure filter
 - ii. Double filtration
 - c. Describe with the help of sketches, a slow sand filter. Explain its working.

Section B

4. Attempt **any two** of the following:

7 x 2

- a. Chlorine usage in the treatment of 25000 m³/day is 9.3 kg/day. The residual chlorine after 12 minutes contact is 0.2 mg/l. Calculate the dosage in milligram per 100 liter and the chlorine demand of water
- b. What do you understand by chlorination? Explain its action in killing bacteria
- c. What do you understand by ozonation? What are its advantages and disadvantages

5. Attempt **any two** of the following:

7 x 2

- a. The analysis of water shows the following: free CO₂ = 3 ppm, alkalinity = 65 ppm, non-carbonate hardness = 95 ppm, total magnesium = 10 ppm. Assume that it is possible to remove all but 30 ppm of carbonate hardness with lime and that the finished water is to have total hardness of 80 ppm. Determine the amount of chemicals required per million liters of water?
- b. What are the advantages and disadvantages of Lime soda process.
- c. Explain Reverse Osmosis Method. Why removal of iron and manganese is necessary ?