

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2018
Subject Code:2151303
Date:27/11/2018
Subject Name:Physico - Chemical Treatment Technologies
Time: 10:30 AM TO 01:00 PM
Total Marks: 70
Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1**
- (a) Give the difference between Primary Treatment and Advanced Treatment. **03**
 - (b) Differentiate between Surface Water Treatment & Ground Water Treatment. **04**
 - (c) Write a Short note on “Aerated Grit Chamber”. Draw a line sketch of it. **07**
- Q.2**
- (a) Which factors affect on Headloss of Screens. Explain each in detail. **03**
 - (b) Explain the importance of Alkalinity in Coagulation. **04**
 - (c) Estimate the headloss for a clean bar rack and 50% blockage of bar rack. Assume following data: **07**
 1. Approach Velocity in channel = 0.53 m/s
 2. Velocity through Clean Screen = 0.93 m/s
 3. Empirical discharge coefficient when bar rack is clean & blocked = 1.67 & 1.43 respectively.

OR

- Q.2**
- (a) Enlist different types of Flocculators. Explain any one. **03**
 - (b) Explain the term “Zeta Potential” with neat sketch. **04**
 - (c) A bar screen is inclined at 60° angle from horizontal. The rectangular bars have width 15 mm & spacing 20 mm. Total Number of spacing are 25. Determine the headloss when the bars are clean & Velocity approaching the screen is 1 m/s. Assume bar shape factor is 1.83 **07**
- Q.3**
- (a) A rectangular sedimentation tank has a length of 8 m and a width of 5 m. For a flow rate of 1 MLD, calculate the Weir Overflow Rate. **03**
 - (b) Assuming the diameter of a clarifier to be 18 m and the wastewater flowrate 9 MLD. Calculate the detention time and Surface Loading Rate of the clarifier having a wastewater depth of 2.4 m **04**
 - (c) Derive Stock’s Law for settling of discrete particle when flow pattern is Laminar. **07**

OR

- Q.3**
- (a) Define: Scour Velocity & Terminal Velocity. **03**
 - (b) Write a short note on Tube Settler. **04**
 - (c) Find the terminal settling velocity of spherical particle with a diameter 0.5 mm and specific gravity 2.65 settling through water. Assume that Kinematic Viscosity $1.004 \times 10^{-6} \text{ m}^2/\text{s}$. **07**

- Q.4 (a) Define Effective Sand Size & Weighting importance in Rapid Sand Filter (RSF). 03
 (b) Explain mechanism of Suspended Solid removal in filter. 04
 (c) Write the working of Rapid Sand Filter with neat sketch. 07

OR

- Q.4 (a) Explain the Chlorine reactions with Ammonia at different pH and define combined chlorine. 03
 (b) Explain the term Pre-Chlorination and Super Chlorination. 04
 (c) Give the comparison between Chlorine and Ozone as a disinfectant. 07

- Q.5 (a) Define: Sludge Dewatering & Sludge Thickening. Mention the %solids content of Dewatered Sludge & Thickened Sludge. 03
 (b) Highlight the components of Filter Press in a sketch. Explain the process & Enlist advantages & disadvantages of it. 04
 (c) Explain reaction Chemistry of following Coagulants: 07
 i. Alum and ii. Lime

OR

- Q.5 (a) Give the Drinking Water Permissible Limit and explain the importance of following parameters: 03
 i. Fluoride ii. Total Dissolved Solids iii. Nitrates
 (b) Explain the Principle on which Decanter works. Enlist the components & explain purpose of each component with neat sketch. 04
 (c) Settling Column Tests on a Discrete Particle Suspension gave the following results from a depth to 1.3m. 07

Sampling Time (min)	5	10	20	40	60	80
% of SS in sample	56	48	37	19	5	2

Determine the theoretical removal of solids from this suspension in a horizontal flow sedimentation tank with Surface Overflow Rate of $200 \text{ m}^3/\text{m}^2 \text{ day}$.
