B.E.-Civil Engineering Sem VIII

CE811 - Elective-IV : Design of Water and Waste Water Treatment System

P. Pages : 2 **GUG/S/18/7027**

Time : Three Hours * 2 1 4 3 * Max. Marks : 80

Notes : 1. All questions carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.
5. Use of non programmable electronic calculator is permitted.

1. a) Write short notes on Site selection for water treatment plant. **8**

b) Explain the objectives & mechanism of aeration process. Discuss the various types of aerators. **8**

OR

2. a) Design and draw the neat sketch of a cascade aerator for a design flow of 15 MLD Assume suitable data, where needed. **10**

b) Explain gas transfer with the help of 'Two Film Theory'. **6**

3. a) Design a clariflocculator unit for a flow of 200m^3/hr. Assume the temperature at treatment site is 20ºC. Draw a neat sketch. **10**

b) One million liters of water per day is passing through a sedimentation tank which is 6m wide. 15cm long & having water depth of 3m (a) Find the detention time for the tank (b) what is the average flow velocity through the tank? (c) If 50 ppm is the concentration of suspended solids present in turbid raw water how much dry solids will be deposited per day in the tank assuming 70% removal in the basin, & average sp. Gr. of the deposit as 2 (d) Compute the overflow rate. **6**

OR

4. a) Design the mechanical rapid mix unit for design flow to be treated equal to 250m^3/day. Assume suitable permissible value for various parameters of design. Assume a temperature of 20ºC. **8**

b) Design a circular sedimentation tank to remove alum floc with following data. **8**

- Average output for settling tank = 200m^3/hr
- Amount of water lost in desludging = 2%
- Minimum size of alum floc to be removed = 0.8mm
- Specific gravity = 1.002
- Expected removal efficiency = 70%
- Assume performance of settling tank = very good
- Kinematic viscosity at 20ºC = $1.01 \times 10^{-6} m^2$ / sec

5. a) Prepare a filter sand of effective size 0.5 mm and uniformity coefficient 1.8 from the stock sand. The sieve analysis for stock sand being given as follows: **10**

Sand size (mm)	0.21	0.30	0.42	0.84	1.12	1.68	2.38
Cumulative weight (%) passing	3.5	11	22	42	64	83	90

b) With a neat sketch explain Break Point Chlorination. **6**

OR

6. a) Design a rapid sand filter for a town having a total filtered water requirement 200m^3/hr. Assume suitable data. **10**

b) Explain the factors affecting process of chlorination. **6**

7. a) Design a grit chamber having rectangular cross-section along with a proportional flow weir as the velocity control device for following data: **10**

i) Maximum flow = 10 MLD
ii) Ave. temp. = 25ºC
iii) Dia. of smallest grit particles to be removed = 0.2mm
iv) Specific gravity = 2.65.

b) Draw a neat flow diagram of conventional sewage treatment plant. Mark on it Preliminary, Primary and Secondary treatment units. State the objective of each unit in treatment plant. **6**

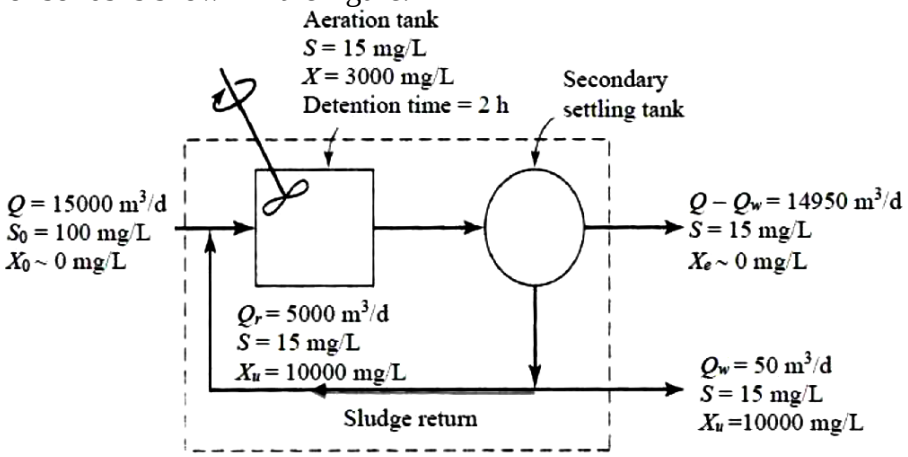
OR

8. a) Draw a neat sketch of bar screen & state the design steps for bar screen. **8**

b) Design a primary settling tank of rectangular shape to treat 10 MLD of wastewater generated from a town. Assume suitable data, if needed. **8**

9. a) What is activated sludge? Described with sketches any one modification of activated sludge process. **10**

b) A schematic flow diagram of a completely mixed biological reactor with provision for recycling of solids is shown in the figure. **6**



S0, S = readily biodegradable soluble BOD, mg/L :: Q, Qr, Qw = flow rates, m^3/d X0, X, Xe, Xu = MLVSS, mg/L.
Determine Mean Cell Residence Time.

OR

10. Write short notes on **any three:** **16**

- Aerated lagoons.
- Trickling filters
- Difference between aerobic and anaerobic treatment processes
- Mechanism of Anaerobic Sludge digestion.
- Oxidation Ponds

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