B.E. (Civil Engineering) Model Curriculum Semester-VIII

PEC-2-CE803 : Design of water and Waste Water Treatment System

P. Pages : 3 **GUG/W/24/14336**

Time : Three Hours * 5 8 2 1 * 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. Diagrams and Chemical equation should be given wherever necessary.
5. Illustrate your answers wherever necessary with the help of neat sketches.
6. Discuss the reaction, mechanism wherever necessary.

1. a) Design and draw the neat sketch of a cascade aerator for a design flow of 10 MLD. Assume suitable data if needed. **8**

b) What are the objectives of water treatment process and draw flow diagram for unit operation with function of each unit. **8**

OR

2. a) What are the objectives of aeration and describe types of aerators with neat sketch. **8**

b) Write down the various points to be considered on site selection for water treatment plant. **8**

3. a) Write a note on 'Feeding devices'. **8**

1) Dry feeding device

2) Wet feeding device

b) 8 mg of copperas is consumed with lime at a coagulation basin, per liter water. Determine the quantity of copperas and the quick lime required to treat 10 million liters of water. **8**

OR

4. a) Two million liters of water per day is passing through a sedimentation tank which is 6 m wide, 15 m long and having a water depth of 3 m. **8**
a) Find the detension time for the tank.
b) What is the average flow velocity through the tank?
c) If 60 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, and average specific gravity of the deposit as 2.
d) Compute the overflow rate.

b) A rectangular settling tank without mechanical equipment is to treat 1.8 million liters per day of raw water. The sedimentation period is to be 4 hours, the velocity of flow 8 cm/minute, and the depth of the water and sediment 4.2 m. If an allowance & 1.2 m for sediment is made, what should be (a) the length of the basin, (b) the width of the basin? **8**

5. a) Write down the working construction of slow sand filter, with neat sketch. **8**

b) Filter sand is to be prepared for a rapid sand filter from the stock sand for which the details of sieve analysis are given below: **8**

Sieve size mm	Mass retained (g)	Sieve size mm	Mass retained (g)
2.0	0	0.50	168
1.5	100	0.40	159
1.2	125	0.30	165
1.0	150	0.20	95
0.9	210	0.10	120
0.8	115	0.08	51
0.75	100	0.06	33
0.70	170	Finer	04
0.60	235		

The required effective size and the uniformity coefficient of the filter media is 0.3 mm and 2.5, resp. Determine amount of usable sand and percentage and size above and below which the sand is too coarse or too fine.

OR

6. a) Write down the different types of chlorination. **8**

b) Results of chlorine demand test on a raw water are given below: **8**

Sample No.	Chlorine dosage mg/l	Residual chlorine after 10 min contact (mg/l)
1	0.2	0.19
2	0.4	0.36
3	0.6	0.50
4	0.8	0.48
5	1.0	0.2
6	1.2	0.4
7	1.4	0.6
8	1.6	0.8

Sketch a ‘Chlorine demand curve’ What is the ‘break point dosage’ and what is the ‘chlorine demand’ at dosage of 1.2 mg/l?

7. a) Design a bar screen for peak average flow & 40 million liters per day. **8**

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. **8**

OR

8. a) Design a grit chamber having rectangular cross-section along with a proportional flow weir as the velocity control device for following data: **8**

1) Maximum flow = 10 MLD
2) Average temp = 25ºC
3) Dia. of smallest grit particles to be removed = 0.2 mm.
4) Specific gravity = 2.65

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) Design the size of high rate trickling filter for the following data: **8**

1) Sewage flow 5 MLD
2) Recirculation ratio = 1.5
3) BOD of raw sewage 230 mg/l
4) BOD removal = 30%
5) Final effluent BOD desired = 25 mg/l.

b) Design conventional ASP to treat settled domestic sewage with diffused air aeration system for- **8**

1) Population = 1,20,000
2) Per capita sewage contribution = 160 LPCD
3) Settled sewage BOD_5 = 200 mg/l
4) Effluent BOD_5 required = 15 mg/l

OR

10. Write short note on **any four.** **16**

a) Aerated Lagoons

b) Trickling filters

c) Oxidation pond

d) Sludge drying beds

e) Sludge digestion

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