CE807 - Design of Water & Waste Water Treatment System

P. Pages : 2

GUG/S/23/13593

Time : Three Hours

2321

Max. Marks : 80

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Notes :
1. Due credit will be given to neatness and adequate dimensions.
2. Assume suitable data wherever necessary.
3. Diagrams and Chemical equation should be given wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.
5. Discuss the reaction, mechanism wherever necessary.

1. a) Explain the objectives of water treatment and explain unit functions of conventional water treatment plant with flow diagram. **8**

b) Design and draw the neat sketch of a cascade aerator for a flow of 30MLD. Assume suitable data. **8**

OR

2. a) Explain in detail 'Two Film Theory'. **8**

b) Write short notes on site selection for water treatment plant. **8**

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

b) Determine the quantity of alum required in order to treat 13 million litter of water per day at treatment plant where 12PPM & alum dose is required. Also determine the amount of carbon dioxide gas which will be released per litter of water treated. **6**

OR

4. a) Design a coagulation cum sedimentation tank with continuous flow for a population of 70,000 persons with daily per capita water allowance 130 litters. Make suitable assumption where needed. **10**

b) Find the settling velocity of spherical silica particle of specific gravity 2.67 in water at 25ºC. If the diameter of particle is 0.004cm. **6**

5. a) Design a rapid sand filter for a town having a total filtered water requirement $300 \, m^3/hr$. Assume suitable data. **8**

b) Result of chlorine demand test on raw water as given below. **8**

Sample No.	Chlorine dose (mg/lit)	Residual chlorine after 10min contact (mg/lit)
1	0.17	0.15
2	0.36	0.30
3	0.48	0.39
4	0.6	0.28
5	0.85	0.45
6	1.1	0.8
7	1.3	0.65

Sketch chlorine demand curve what is break paint does and what is the chlorine demand at dose of 3.1 mg/lit?

OR

6. a) With a neat sketch explain Break point chlorination. **6**

b) State and explain various methods of Disinfection. **6**

c) Explain factors affecting efficiency of chlorination. **4**

7. a) Design a bar screen chamber for average sewage flow 20MLD minimum sewage flow of 15MLD and maximum flow of 30MLD. **8**

b) Design a horizontal flow grit chamber with rectangular cross section for treating maximum sewage flow of 10MLD at maximum temperature of 34ºC during summer and minimum temperature of 15ºC in winter. **8**

OR

8. a) Draw the conventional flow diagram of waste water treatment plant and explain the function of each unit in brief. **8**

b) Explain with neat sketch working of Skimming tank. **8**

9. a) What is meant by activated sludge? Give the flow diagram for 'activated sludge process' and describe the working of activated sludge plant, Explain the modification in ASP. **8**

b) What do you understand by 'digestion of sludge'? Differentiate between anaerobic and aerobic digestion. Explain the mechanism of anaerobic digestion. **8**

OR

10. a) Write a short note on **any two.** **8**
   i) Stabilization pond   ii) Imhoff tank
   iii) BOD/COD ratio

b) Design the size of high rate trickling filter for the following data. **8**
   i) Sewage flow 7.5MLD   ii) Recirculation ratio - 1.5
   iii) BOD of raw sewage 230 mg/L   iv) BOD removal - 40%
   v) Final effluent BOD desired - 25mg/l

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