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

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

P. Pages : 2 **GUG/S/23/14336**

Time : Three Hours Max. Marks : 80

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) What are the objectives of water treatment. Explain unit operation and unit processes of conventional water treatment plant. **8**

b) What are the points to be considered while selecting site for water treatment plant. **8**

OR

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

b) i) Write a note on 'Spray Aerator'. **4**

ii) Write a note on 'Diffused Air Aerator'. **4**

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

b) Design a rectangular sedimentation tank to treat 2.4 million litres of raw water per day. The detention period may be assumed to be 3 hours. **6**

OR

4. a) A setting basin is designed to have a surface overflow rate of 32.6 m/day. Determine the overall removal obtained for a suspension with size distribution given below. The specific gravity of the particles is 1.2 and water temperature is 20ºC at which the dynamic viscosity is $1.03\times10^{-6}\ m^2/s$. **8**

Particle size (mm)	0.10	0.08	0.07	0.06	0.04	0.02	0.01
Wt fraction greater than size (%)	10	15	40	70	93	99	100

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

Average output for settling tank = $200\ m^3/hr$
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 = $1.01\times10^{-6}\ m^2/s$

5. a) Describe with the help of neat sketch a slow sand filter. Explain its working. **6**

b) Design a rapid sand filter unit for 4 million litres per day of supply, with all its principal components. **10**

OR

6. a) Explain the various types of disinfectants. **8**

b) Define chlorination. Explain breakpoint chlorination in brief. **8**

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 =10MLD
ii) Ave. temperature =20ºC
iii) Dia. of smallest grit particles to be removed =0.2mm
iv) Specific gravity =2.65

b) Draw a neat diagram of conventional sewage treatment plant mark on it primary, preliminary and secondary treatment units. State the objectives of each unit in treatment plant. **6**

OR

8. a) Design a bar screen for a peak average flow of 20MLD. Assume necessary design parameter if needed. **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) Design conventional ASP to treat settled domestic sewage with diffused air aeration system for- **8**

i) Population =1,20,000
ii) Per capital sewage contribution =160 LPCD
iii) Settled sewage BODs = 200 mg/L
iv) Effluent BODs required = 15mg/L

b) An average operating data for Activated sludge process is as follows: **8**

i) Waste water flow $= 500\,m^3/hr$
ii) Vol. of aeration tank $= 4000\,m^3$
iii) Mean cell resistance time = 240 hrsl
iv) Influent BOD = 150 mg/l
v) Effluent BOD = 10 mg/l
vi) MLSS = 2000 mg/l
vii) Hydraulic retention time = 8hrs.

Determine-

i) F/M ratio
ii) Mass of solids in kg/d wasted from system

OR

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

i) Aerated lagoons
ii) Stabilization pond
iii) Trickling filters
iv) Oxidation pond
v) Sludge drying beds

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