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Sixth Semester B.E. Degree Examination, Dec.2014/Jan.2015
Waste Water Treatment Engineering

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer any FIVE full questions, selecting*
atleast TWO questions from each part.
2. *Substantiate your answer with neat sketches, wherever necessary.*
3. *Assume missing data, if any.*

PART - A

1 a. With the help of a flow diagram, briefly explain the functions of physical unit operations, chemical and biological unit processes employed in wastewater treatment. **(10 Marks)**

b. With neat sketches, explain the working of i) Aerated grit chamber   ii) Vortex type grit chamber. **(10 Marks)**

2 a. Describe the different types of screens based on size, location and purpose. Draw the plan of a fixed bar type screen and name the parts. **(10 Marks)**

b. Design a bar screen for a peak average flow of 40MLD with following data :
i) Inclination of bars = 45° with vertical.
ii) Bar size = 50mm × 9mm.
iii) Clear spacing = 36mm.
iv) Velocity through the screen = 0.8m/s @ peak flow. **(10 Marks)**

3 a. Explain the various loading criteria used for aeration tank of activated sludge process. **(10 Marks)**

b. Design a conventional activated sludge plant to treat settled domestic waste water with diffused air aeration system, for the following data :
i) Population : 1,20,000.
ii) Per capita W/W contribution : 160 ℓpcd.
iii) Settled W/W BOD_5 : 200 mg/ℓ.
iv) Effluent BOD_5 desired : 15 mg/ℓ. Assume F/M = 0.2, MLSS = 3000 mg/ℓ. **(10 Marks)**

4 a. Differentiate between attached growth and suspended growth processes. List various treatment techniques falling under each category. **(05 Marks)**

b. What are "Stabilization ponds"? How are they classified? Discuss with examples. **(05 Marks)**

c. Determine the size of a high rate trickling filter with following data :
i) Wastewater flow : 5MLD.   ii) Recirculation ratio : 1.5.
iii) BOD of raw wastewater : 230 mg/ℓ.   iv) BOD removal in primary clarifier : 30%.
v) Effluent BOD_5 desired : 25 mg/ℓ. **(10 Marks)**

PART - B

5 a. What are the different types of sludge thickening? Explain any one method in detail. **(10 Marks)**

b. Design a digestion tank for sludge settled in primary clarifier, with following data :
i) Average flow = 200 MLD   ii) Total suspended solids in raw sludge = 300 mg/ℓ
iii) Moisture content of digested sludge = 85%. **(10 Marks)**

6 a. What is meant by digestion of sludge? Explain the factors affecting sludge digestion.

(10 Marks)

b. Design a sludge drying bed for digested sludge of ASP for a population of 2,00,000. Solids in digested mixed sludge is 60g/head/day and dry solids loading rate is $100kg/m^2/year$. Percentage of solids is 6 and specific gravity is 1.02. **(10 Marks)**

7 a. Draw a neat sketch of sludge drying bed and name the salient features. **(05 Marks)**

b. Write a brief note on sludge volume index. **(05 Marks)**

c. List and explain in detail, the various methods for disposal of sludge from wastewater treatment plant. **(10 Marks)**

8 a. Differentiate between aerobic and anaerobic digestion. Bring out the design criteria of anaerobic digestor elements. **(10 Marks)**

b. With a neat sketch, explain the working of an anaerobic sludge digestor. **(10 Marks)**

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