

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VIII(NEW) EXAMINATION – SUMMER 2019

Subject Code:2183507
Date:15/05/2019
Subject Name:Design of Treatment Plants
Time:10:30 AM TO 01:00 PM
Total Marks: 70
Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

		MARKS
Q.1	(a) Differentiate unit operations & unit process. Quote one example of each.	03
	(b) Explain impacts of improper storm water management.	04
	(c) Determine terminal settling of a sand particle with an average diameter of 0.5mm and density of 2600 kg/m ³ settling in water at 20 C. (viscosity = 1.01 * 10 ⁻³ Ns/m ²)	07
Q.2	(a) Define Sedimentation. Also explain the following terms. <ol style="list-style-type: none"> 1. Discrete Settling 2. Flocculent Settling 3. Zone Settling 	03
	(b) Explain treatability study of activated sludge process.	04
	(c) Using Rankin's method and assuming suitable design criteria, design a high rate trickling filter to treat 10 MLD flow of domestic waste water having settled BOD of 200 mg/l. Design Criteria & Assumptions: <ol style="list-style-type: none"> a) Concentration of desired effluent BOD = 30 mg/l b) Depth of filter media = 2 m c) Applied BOD to the filter is settled BOD d) Assume organic loading as 1 kg BOD/ d.m3 volume of filter 	07
	OR	
	(c) Using the Velz equation, determine the filter depth of a low rate trickling filter, if settled ultimate BOD is 100 mg/L and desired BOD ₅ is 20 mg/L. (Let's assume BOD ₅ = 68% of Ultimate BOD, Removable effluent BOD = 95% and k=0.18) find C, C _{nr} , CD and D.	07
Q.3	(a) With the help of a neat sketch explain working of UASBR.	03
	(b) Explain working of clarifier with its neat sketch.	04
	(c) A water treatment plant has a flow rate of 0.6 m ³ /sec. The settling basin at the plant has an effective settling volume that is 20 m long, 3 m tall and 6 m wide. Will particles that have a settling velocity of 0.004 m/sec be completely removed? If not, what percent of the particles will be removed? How big would the basin need to be to remove 100% of the particles that have a settling velocity of 0.004 m/sec?	07
	OR	
Q.3	(a) Explain treatment plant of surface water with its neat sketch.	03
	(b) Write a diagram for scale up.	04
	(c) Design a PST to treat domestic wastewater with flow of 250 LPCD of a town having 5 lakh populations.	07

Assume following data:

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1. ww generation = 80% of water consumption
2. s.s. in water = 250 mg/l
3. BOD₅ 20°C of ww = 200 mg/l
4. SLR = 40 m³/m²•d(daily of avg. flow)
= 100 m³/m²•d(daily of peak flow)
5. Detention time – 2 hr

- Q.4** (a) Explain membrane system in cleaner production. **03**
(b) Draw a water quality diagram for DO sag curve. **04**
(c) Assume flowing design criteria for DAF thickener to increase the conc. of activated sludge solid from 0.25 - 4.5%. **07**

SLR = 10 m/day

Sludge flow rate = 450 m³/d

Operating temperature = 30 degree Celsius

Air solubility S'a = 15.7 ml/l

A/S = 0.02 ml/mg

Recycled system pressure, P = 300 kPascal

OR

- Q.4** (a) Explain different screens with their mesh size. **03**
(b) Explain onsite treatment process for pharma sector. **04**
(c) Narrate any two example of ZLD in chemical industry. **07**
- Q.5** (a) Explain data analysis for waste water characteristics. **03**
(b) Write a note on secondary settling tank. **04**
(c) Write a note on multi-effect evaporator. **07**

OR

- Q.5** (a) What is a working of grit chamber? **03**
(b) Write a note on trickling filter. **04**
(c) On which mechanism neutralization and equalization tank works? What is a difference and similarities between them? **07**
