



GUJARAT TECHNOLOGICAL UNIVERSITY
BE – SEMESTER-VI- (NEW) EXAMINATION- SUMMER 2018

Subject Code: 2163509

Date: 05/05/18

Subject Name: Liquid Effluent Treatment - II

Time: 10:30 PM – 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) A treatment unit is 1.5m wide and 20m long and has a wastewater depth of 2m in it. If the wastewater flow in the tank is $0.5\text{m}^3/\text{s}$. calculate the detention time	03	
	(b) Trickling filter has a diameter of 20 m and a liquid depth of 2.5 m. calculate the organic loading for the influent of 10 MLD having 220 mg/l of BOD.	04	
	(c) What do you mean by screens? Explain the detailed classification of screens.	07	
Q.2	(a) Enlist different types of grit chambers.	03	
	(b) Find the terminal settling velocity of a spherical particle with diameter 0.05mm of specific gravity 2.65 settling through water having kinematic viscosity $1.004 \times 10^{-6} \text{ m}^2/\text{sec}$.	04	
	(c) What do you mean by strength equalization?	07	
OR			
Q.3	(c) Give an outline of the Effluent treatment plant	07	
	(a) Define the following: 1) Detention time 2) Endogenous Decay 3) SOR 4) WOR	03	
	(b) Explain in brief different types of aerator used in wastewater treatment systems.	04	
Q.3	(c) Design a Clarifier with a flow of 2 MLD: 1. HRT = 3 HRS 2. Height of clarifier = 6m 3. C-C distance between notches = 20 cm	07	
	OR		
	(a) A floating sticks travels a distance of 15 m in 30 seconds in a reactor tank having 2m width and 1.5 m depth. Determine the flow and flow through velocity.	03	
(b) Differentiate attached growth and suspended growth process.	04		
(c) Assuming suitable design criteria, design an aerated grit chamber for an average municipal wastewater flow of 10 MLD. Take peaking factor as 2.5 and 5 minutes as a detention time. 1) Liquid Depth = 2.0 m 2) Width-Depth ratio = 1.5 : 1 3) Air supply rate = $0.3 \text{ m}^3/\text{min-m}$ 4) Grit settling rate = $0.015 \text{ m}^3/1000 \text{ m}^3$ of flow	07		



- (a) Discuss characteristic of wastewater in brief. 03
- (b) Explain microbial growth pattern curve in waste water treatment systems. 04
- (c) Design an oil & grease trap to remove 200 mg/l of oil & grease from a flow of 60000 m³/d of domestic wastewater. 07

OR

- Q.4**
- (a) What do you mean by flow equalization? 03
 - (b) For an activated sludge process system with recycle, calculate the MCRT for the given data. 04
 - 1) Daily average wastewater flow = 10 MLD
 - 2) Effluent flow rate of wastewater = 9.92 MLD
 - 3) Sludge wasting flow = 0.08 MLD
 - 4) HRT = 6 hrs
 - 5) Active biomass conc in the reactor = 3000 mg/l
 - 6) Biomass conc in the effluent = 20 mg/l
 - 7) Biomass conc in the return line = 9000 mg/l.
 - (c) Design a Tube Settler Module of a Square Cross section with the following data: 07
 - 1) Avg output required from settle = 6 MLD
 - 2) Loss of water in desludging = 2% of output
 - 3) Diameter of tube = 0.05 m
 - 4) Angle of inclination = 60
 - 5) Kinematic viscosity = 1.01 x 10⁻⁶ m²/s
 - 6) Critical settling velocity = 120 m/day
 - 7) Length of tube = 1 m
 - 8) C.S Sq area of tube = 0.05m x 0.05m

- Q.5**
- (a) What do you mean by head loss in screens? 03
 - (b) Write a note on Rectangular horizontal flow type of grit chamber. 04
 - (c) Design two identical bar rack screens for a treatment plant handling the peak flow of 210 MLD. Assume the other conditions as follows: 07
 - 1. Velocity through screen at peak flow = 1.2 m/s
 - 2. Clear spacing between the bars = 25 mm
 - 3. Bar size = 10 mm x 50 mm
 - 4. Angle of bars with inclination = 80
 - 5. Peak factor = 2
 - 6. Depth of flow in chamber = 1.1 m
 - 7. K = 1.43
 - 8. G = 9.8 m/s²

OR

- Q.5**
- (a) For a circular diameter of 20 m diameter, determine the weir loading rate for a wastewater flow rate of 10 MLD. 03
 - (b) The cumulative flow of wastewater reaching at the end of time period to a treatment plant in a day varies as shown below. Determine the capacity of an equalization tank for the given flow variation. 04

Time (H)	0	2	4	6	8	10	12	14	16	18	20	22	24
Cumulative Flow (m ³)	0	25	50	75	100	120	130	140	150	160	170	198	225

- (c) Explain in brief the removal of biological phosphorus from waste water. 07
