Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2023
Subject Code:3171306   **Date:12-12-2023**
Subject Name: Wastewater Engineering
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.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Define SOR and WOR.	**03**
	(b)	State design criteria for Septic tank.	**04**
	(c)	Draw Treatment scheme diagram to treat ground water along with the function of each unit.	**07**
Q.2	**(a)**	Enlist objectives of providing influent structure in primary sedimentation basin.	**03**
	(b)	Differentiate between in line and off line equalization basin.	**04**
	(c)	List down design criteria of aerated grit chamber.	**07**

<div align="center">OR</div>

	(c)	Design a screen chamber to treat average flow of 0.6 m3/s of sewage. Assume all the necessary data	**07**
Q.3	**(a)**	Compare SBR with conventional ASP.	**03**
	(b)	Discuss about the possible condition responsible for reducing efficiency of a clarifier.	**04**
	(c)	Assuming suitable design criteria design a grit chamber with proportional flow weir to treat 900 m3/h of average flow.	**07**

<div align="center">OR</div>

Q.3	**(a)**	Discuss operational and maintenance problem of coarse screen and also troubleshooting operation.	**03**
	(b)	Design oil and grease trap for wastewater flow of 0.50 m3/min having oil and grease concentration of 190 mg/L. Desired concentration in treated effluent is 25 mg/L.	**04**
	(c)		**07**

Time (h)	1	2	3	4	5	6	7	8	9	10	11	12
Flow (m3/min)	2.0	7.2	7.5	6.7	8.3	9.3	20.0	25	31	27.5	24	20
Time (h)	13	14	15	16	17	18	19	20	21	22	23	24
Flow (m3/min)	21	19	15	10	6.5	7.6	7.2	6.8	5.5	4.5	3.5	3.0

The data of wastewater generated by a community on an hourly basis is tabulated below. Design equalization basin using the given data.

Q.4 (a) Write the Eckenfelder questions (with & without recirculation) for Bio tower design. **03**

(b) A city need to design sludge drying bed to dewater digested sludge produce from Sequencing bed reactor based municipal wastewater treatment plant for 55000 populations. Dry solid concentration in digested sludge is 78 g/capita/d. Assuming suitable design criteria design sludge drying bed. **04**

(c) Tabulate important process parameters to design UASB. **07**

OR

Q.4 (a) Discuss about SVI in brief. **03**

(b) Discuss the removal mechanism of organic content in waste stabilization pond. **04**

(c) Design UASB reactor using following data: **07**

Wastewater flow	7 MLD
Upflow velocity	0.7 m/h
Influent BOD	290 mg/L
Influent COD	730 mg/L
Influent TSS	380 mg/L
Influent VSS	275 mg/L
Desire effluent BOD	80 mg/L

Q.5 (a) Define the following terms **03**
  (i) Sludge
  (ii) Biosolids
  (iii) Sludge dewatering

(b) Discuss various chemical and biochemical reactions involved in anaerobic digestion of sludge. **04**

(c) Design Rotating biological contactor to treat 12 MLD domestic wastewater having BOD 5 concentration of 280 mg/L. 27 % BOD_5 removes in primary treatment. Desired effluent BOD_5 is 30mg/L. Assume 0.06 m^3/m^2-d hydraulic loading. Also assume necessary data **07**

OR

Q.5 (a) List down advantages of filter press. **03**

(b) State design criteria for Sludge Drying beds. **04**

(c) Design waste stabilization pond for following data **07**
Waste water flow 2.5 MLD
Detention time = 12 days
Organic loading = 250 BOD_5/ha/d
BOD_5 =210 mg/L

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