

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-V EXAMINATION – WINTER 2025****Subject Code:3151303****Date:19-11-2025****Subject Name:Physico-chemical Treatment Technology****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) Difference between unit operation and unit process.	03
	(b) Enlist and explain 4 physical parameters of water along with sources and effects of each parameter.	04
	(c) Draw a detailed sketch of surface water (River water) treatment for drinking purpose and explain each unit in detail.	07
Q.2	(a) What is screen? Write importance of screen in Water and wastewater treatment.	03
	(b) Write the different empirical formula for determination of headloss through fine and coarse screen.	04
	(c) Explain the types of Grit chamber with neat sketch.	07
	OR	
	(c) Write down chemical reactions involved with Alum, Copperas and Ferric chloride; (i) When bicarbonate alkalinity present and (ii) When Lime added	07
Q.3	(a) Explain the phenomenon of flocculation for water and waste-water treatment.	03
	(b) A bar screen is inclined at 60 angle from horizontal. The rectangular bars have width 15 mm & spacing 20 mm. Total number of spacing are 25. Determine the headloss when the bars are clean and velocity approaching 1 m/s. Assume bar shape factor is 1.83.	04
	(c) Enlist and explain the mechanisms of coagulation.	07
	OR	
Q.3	(a) Determine the amount of $\text{Fe}(\text{OH})_3$ produced and amount of alkalinity consumed when 62 mg/L of FeCl_3 is added to water.	03
	(b) Draw a neat sketch of functional zone of sedimentation tank for horizontal flow.	04
	(c) Define following terms along with equation and explain its importance for design of sedimentation tank: (i) Detention time, (ii) Surface overflow rate, (iii) Weir overflow rate and (iv) Scour velocity	07
Q.4	(a) Why dewatering of sludge is required?	03
	(b) Briefly explain the jar test in detail with a diagram.	04
	(c) Derive the Newton's law for settling velocity of discrete particle.	07
	OR	
Q.4	(a) Write a short note on Tube settler.	03
	(b) Explain the process of aerobic and anaerobic digestion.	04
	(c) Differentiate between Slow Sand Filter and Rapid Sand Filter.	07

- Q.5 (a)** For a circular clarifier of 22 m diameter and flow rate of 10 MLD. Determine Weir Overflow Rate (WOR). **03**
- (b)** Write down the definitions: **04**
(i) Sludge conditioning, (ii) Leachate, (iii) Bio solid and (iv) Thickening
- (c)** With the help of a neat sketch, explain the construction and working of Rapid Sand Filter. **07**

OR

- Q.5 (a)** Explain disinfection and sterilization. Give an example of each one. **03**
- (b)** Write down the characteristics of an ideal disinfectant. **04**
- (c)** Define and explain following terms: **07**
(i) Free available chlorine, (ii) Super chlorination, (iii) Plain chlorination, (iv) Post chlorination, (v) Pre chlorination and (vi) Double chlorination.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-V (NEW) EXAMINATION – WINTER 2024

Subject Code:3151303

Date:28-11-2024

Subject Name:Physico-chemical Treatment Technology

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) Why are screens necessary before the treatment of wastewater?	03
	(b) Explain the procedure for statistical analysis of waste water flow rate data.	04
	(c) Draw neat sketch and explain Conventional Waste-water Treatment Plant and explain The different units along with their functions.	07
Q.2	(a) Differentiate between Unit process and unit operations.	03
	(b) Enlist and explain the mechanisms of coagulation. (Along with diagram).	04
	(c) Explain jar test procedure for determining the optimum dose of chemical coagulant. What is the relation between pH, alkalinity & alum?	07
	OR	
	(c) Prepare a list of different chemical coagulants & explain the chemical reaction when alum is used as a coagulant.	07
Q.3	(a) Define 'Grit Chamber'. State its purpose.	03
	(b) Write a short note on grit removal mechanism.	04
	(c) Discuss aerated grit chamber with neat sketch. Also explain advantages and disadvantages of it.	07
	OR	
Q.3	(a) Define screen. State the purpose of screen.	03
	(b) Explain the classification of screens in detail with neat and labeled sketches.	04
	(c) Derive the Newton's law for settling velocity of a discrete particle.	07
Q.4	(a) Differentiate between flocculation and coagulation.	03
	(b) Write a short note on tube settler with neat sketch.	04
	(c) Explain the construction and working of a Slow Sand Filter along with a neat sketch.	07
	OR	
Q.4	(a) Write a note on "Operational difficulties of RSF".	03
	(b) Why sedimentation operation is important for water and wastewater treatment?	04

- (c) Explain the construction and working of a Rapid Sand Filter along with a neat sketch. **07**
- Q.5** (a) What do you mean by disinfectant? Discuss the objectives of Disinfection. **03**
- (b) Enlist and explain the factors affecting the efficiency of disinfection process. **04**
- (c) Explain Break-point chlorination and its significance to determine the chlorine demand. **07**
- OR**
- Q.5** (a) Define decanter and explain in Details. **03**
- (b) Explain sludge drying beds. Enlist and explain types of drying beds. **04**
- (c) Describe the methods normally used to process the sludge before its final disposal. **07**

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2023

Subject Code:3151303

Date:07-12-2023

Subject Name: Physico-chemical Treatment Technology

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.

Q.1 (a) Explain the procedure for statistical analysis of wastewater flow rate data. **03**

(b) What is unit process? List down different unit processes used for waste water treatment. **04**

(c) Explain with neat sketch: dissolved air flotation for surface water treatment. **07**

Q.2 (a) Give the classification of screen with opening size. **03**

(b) Write a note on “Operational difficulties of RSF”. **04**

(c) Explain the construction and working of a Slow Sand Filter along with a neat sketch. **07**

OR

(c) Explain the construction and working of a Rapid Sand Filter along with a neat sketch. **07**

Q.3 (a) Write a short note on vortex type Grit Chamber. **03**

(b) Derive the Newton’s law for settling velocity of discrete particle. **04**

(c) Explain the jar test procedure for determining the optimum dose of chemical Coagulant. What is the relationship between pH, Alkalinity and the alum dose? **07**

OR

Q.3 (a) Write a note on tube settlers highlighting its benefits and limitations. **03**

(b) Write a short note on grit removal mechanism. **04**

(c) Write a short note on “Colloidal Stability”. What are the mechanisms of destabilization of colloids? **07**

Q.4 (a) Explain the concept of “Break point Chlorination”. **03**

(b) Enlist the assumptions for ideal sedimentation tank. **04**

(c) Enlist the different types of mixing equipments & explain any one with sketch. **07**

OR

Q.4 (a) Write a short note on ‘Filter backwashing’. **03**

(b) Enlist and explain different types of settling phenomena observed in sedimentation tank. **04**

(c) Differentiate between: (1) rapid mixture & flocculator (2) coagulation & flocculation. **07**

- Q.5** (a) Explain Sludge Drying bed and its design criteria. **03**
(b) What are the advantages of dual media filters as compared to single media filters? **04**
(c) Describe the usual sources of sludge and the characteristics of sludge generated in a conventional wastewater treatment plant. **07**

OR

- Q.5** (a) Why sludge treatment is required? Explain sludge thickening. **03**
(b) Explain anaerobic sludge digestion in detail. **04**
(c) Describe the methods normally used to process the sludge before its final disposal. **07**

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2022****Subject Code:3151303****Date:06-01-2023****Subject Name:Physico-chemical Treatment Technology****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) | What is unit process? List down different unit processes used for waste water treatment. | 03 |
| (b) | Explain the procedure for statistical analysis of wastewater flow rate data. | 04 |
| (c) | Draw a neat sketch of conventional water treatment plant and explain the function of each unit | 07 |

- Q.2**
- | | | |
|-----|---|-----------|
| (a) | Give the detail classification of Screens with their opening size. | 03 |
| (b) | Why are screens necessary before the treatment of wastewater? | 04 |
| (c) | Explain the construction and working of a Rapid Sand Filter along with a neat sketch. | 07 |

OR

- | | | |
|-----|---|-----------|
| (c) | Explain the construction and working of a Slow Sand Filter along with a neat sketch | 07 |
|-----|---|-----------|

- Q.3**
- | | | |
|-----|---|-----------|
| (a) | Write a note on “Operational difficulties of RSF”. | 03 |
| (b) | Write a short note on Mud-ball formation in Sand filter. | 04 |
| (c) | Draw neat sketches of Micro-filtration treatment for surface water. | 07 |

OR

- Q.3**
- | | | |
|-----|---|-----------|
| (a) | Enlist and explain the disinfectants used for water treatment. | 03 |
| (b) | Enlist the factors affecting disinfection. | 04 |
| (c) | With the help of a neat sketch explain the concept of “Break point Chlorination.” | 07 |

- Q.4**
- | | | |
|-----|---|-----------|
| (a) | Write a short note on Aerated Grit Chamber. | 03 |
| (b) | Enlist and explain the factors affecting the process of chlorination. | 04 |
| (c) | Explain the jar test procedure for determining the optimum dose of chemical Coagulant. What is the relationship between pH, Alkalinity and the alum dose? | 07 |

OR

- Q.4**
- | | | |
|-----|--|-----------|
| (a) | Enlist the assumptions for ideal sedimentation tank. | 03 |
| (b) | Explain the phenomenon of flocculation for water and waste-water treatment. | 04 |
| (c) | Write a short note on “Colloidal Stability”. What are the mechanisms of Destabilization of colloids? | 07 |

- Q.5**
- | | | |
|-----|---|-----------|
| (a) | Enlist methods of dewatering and explain any one in detail. | 03 |
|-----|---|-----------|

- (b) Describe Newton's law (Stokes law) for settling velocity of discrete particles. **04**
- (c) Prepare a list of different chemical coagulants. Explain chemical reactions when alum is used as coagulants. **07**

OR

- Q.5** (a) Discuss the objectives of treatment of sludge. **03**
- (b) Explain Sludge Drying bed and its design criteria. **04**
- (c) Describe the methods normally used to process the sludge before its final disposal. **07**
