

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V • EXAMINATION – WINTER 2013****Subject Code: 151303****Date: 04-12-2013****Subject Name: Physico-Chemical Treatment Processes****Time: 10.30 am - 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.**

- Q.1 (a)** Explain the terms: **06**
 (i) Primary , secondary and tertiary treatment.
 (ii) Physical, chemical and Biological processes
- (b)** Derive the Stokes law for finding the terminal settling velocity of discrete particles. Which relationship will be used if the type of flow is turbulent flow? **08**
- Q.2 (a)** Define and explain the sources and effects of **08**
 (i) Total solids (ii) Volatile solids (iii) Total Dissolved Solids
 (iv) Suspended Solids
- (b)** Prepare a list of different chemical coagulants and explain the chemical reactions when alum is used as a coagulant. **06**
- OR**
- (b)** Explain the concept of “Break point Chlorination.” **06**
- Q.3 (a)** Draw a neat sketch of Rapid Sand Filter and explain its construction and working. **07**
- (b)** Enlist and explain the mechanisms of filtration in a Rapid Sand filter. **07**
- OR**
- Q.3 (a)** Give the classification of RSF based on **07**
 (i) Direction of flow
 (ii) Driving force
- (b)** Write a note on “Operational difficulties of RSF”. **07**
- Q.4 (a)** Settling Column tests on a discrete suspension gave the following results from a depth of 2.0 m **08**
- | | | | | | | |
|---------------------|----|----|----|----|----|----|
| Sampling Time(min.) | 5 | 10 | 20 | 40 | 60 | 80 |
| % of S.S. in Sample | 56 | 48 | 37 | 19 | 05 | 02 |
- Determine the theoretical removal of solids from this suspension in a horizontal flow tank with Surface Overflow Rate of $250 \text{ m}^3/\text{day}$.
- (b)** Enlist and explain the different types of settling phenomena observed in a sedimentation tank **06**
- OR**
- Q.4 (a)** If a $1.0 \text{ m}^3/\text{s}$ flow water treatment plant uses ten sedimentation basins with a Surface Overflow Rate of $15 \text{ m}^3/\text{m}^2\text{-d}$, what should be the surface area of each tank? **07**
- Q.4 (b)** Write a brief note on “Tube Settlers”. **07**
- Q.5 (a)** Write a short note on “Mechanisms of Coagulation” **07**
- (b)** In a 50 MLD treatment plant, an alum dose of 125 mg/L is being applied to the raw water which contains about 15 mg/L SS. Estimate the maximum dry sludgein Kg/day which must be removed from the plant and volume of wet sludge which has concentrated to 2% (by weight) **07**
- OR**
- Q.5 (a)** Differentiate between: (i) Coagulation and Flocculation **07**
 (ii) Unit process and unit operations
- (b)** Draw a neat sketch of conventional waste water treatment plant and explain the function of each unit. **07**
