

GUJARAT TECHNOLOGICAL UNIVERSITY**B.E. Sem-Vth Examination December 2010****Subject code: 151303****Subject Name: Physico-Chemical Treatment Technologies****Date: 16 /12 /2010****Time: 03.00 pm - 05.30 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 mechanisms involved in removal of solids in a filter. **06**
(b) Enlist and explain the sources and effects of following parameters in water and wastewater (Any four) : **08**
(i) Oil and grease (ii) Pesticides (iii) Alkalinity
(iv) Phenol (v) Fluorides
- Q.2** (a) Explain the coagulation theory for removal of colloids. **07**
(b) The quantity 50 mg/L of alum is added to 40,000 m³/d of raw water containing 75 mg/L of suspended solids and 152.5 mg/L of HCO₃⁻. (i) Is there sufficient alkalinity in the raw water for chemical precipitation? (ii) If not, how much should be added? (iii) What is the daily consumption of alum and daily production of sludge? **07**
- OR**
- (b) A 20,000 m³/d flow is flocculated in a flocculator. The optimum value of Gt is 5 x 10⁴. Determine : **07**
(i) The basin dimensions. (ii) The fluid power developed.
- Q.3** (a) Draw a neat sketch of Rapid Sand Filter (RSF) and explain its construction and working. **08**
(b) Explain the disinfectants used for water treatment. **06**
- OR**
- Q.3** (a) Answer in short: **06**
(1) What are the advantages of dual media filters as compared to single media filters?
(2) Enlist the methods of intensification of backwashing and explain any one.
(3) With the help of a neat sketch explain Manifold and laterals system of RSF under drainage.
(b) Differentiate between : **08**
(i) Rapid mixer and flocculator
(ii) Coagulation and flocculation
(iii) Perikinetetic and ortho kinetic flocculation
- Q.4** (a) Derive the Stokes law for determining settling velocity of discrete particles. **07**
(b) Assume the diameter of clarifier to be 20 m and the wastewater flow rate 10 MLd . **07**
Calculate the detention time and surface loading rate of the clarifier having a wastewater depth of 2.5 m.

OR

- Q.4 (a)** Draw a neat sketch of Conventional water treatment plant and explain the different units along with their functions. **07**
- (b)** Write a short note on Tube Settler. **07**

- Q.5 (a)** Determine the built up of head loss through a bar screen when 60% of the flow area is blocked off due to the accumulation of coarse solids. Assume the following conditions: **07**

- (i) Approach velocity=0.6m/s
- (ii) Velocity through clean bar screen=0.9 m/s
- (iii) Open area for flow through clean bar screen=0.2m²
- (iv) Head loss Coefficient for clean bar =0.7

- (b)** Explain any one type of Grit Chamber with sketch. **07**

OR

- Q.5 (a)** Describe the usual sources of sludge and the characteristics of sludge generated in a conventional wastewater treatment plant. **07**
- (b)** Describe the methods normally used to process the sludge before its final disposal. **07**
