Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER 2012

Subject code: 711806N **Date: 16-01-2013**

Subject Name: Water and Wastewater Treatment Technologies

Time: 02.30 pm – 05.00 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)**	Enlist and explain the factors affecting anaerobic treatment.	**08**
	(b)	Differentiate between: (i) Dilute suspension and concentrated suspension (ii) Scour velocity and horizontal velocity (iii) Discrete settling and flocculent settling	**06**
Q.2	**(a)**	With the help of a neat sketch explain the different types of under drainage systems in Rapid Sand Filter.	**07**
	(b)	Prepare a list of different methods to find BOD reaction rate constant and explain any one in detail.	**07**
		OR	
	(b)	Prepare a chart to show the classification of different types of solids present in water and wastewater .Give the definition of all the types of solids in water and wastewater.	**07**
Q.3	**(a)**	Give the classification of filters based on the flow rate control and explain the Variable Declining Rate filtration in detail.	**07**
	(b)	Water at 20^0 C is passed through a bed of uniform sand at a filtering velocity of 5.0 m/h. The sand grains are 0.4 mm in diameter with a shape factor of 0.85 and a Specific gravity of 2.65.The depth of the bed is 0.67 m and porosity is 0.4.Determine the head loss through the sand bed. Take kinematic viscosity as 1.002×10^{-6} m^2/sec. Use Carman- Kozeny equation.	**07**
		OR	
Q.3	**(a)**	Prepare a list of different types of coagulants used in treatment of water and wastewater. Explain with the help of chemical reactions, the role of alkalinity in coagulation process.	**08**
	(b)	Differentiate between: (i) Coagulation and flocculation (ii) Primary treatment and secondary treatment.	**06**
Q.4	**(a)**	Write a short note on horizontal flow Grit chamber with sketch	**07**
	(b)	Write a short note on "Variations in wastewater flow rates."	**07**
		OR	
Q.4	**(a)**	Explain the different zones of sedimentation tank in detail.	**07**
Q.4	**(b)**	Particles having settling velocity Vs 0.7 mm/s are to be settled in a circular section upward flow tube settler 0.6m long by 50 mm deep inclined at 60^0 to the horizontal. Calculate the maximum theoretical flow to the tube in L/sec.	**07**

Q.5 **(a)** Define : **06**

(i) Specific growth rate
(ii) Maximum specific substrate utilization rate
(iii) Specific substrate utilization rate
(iv) Food to microbe ratio
(v) Sludge Retention Time
(vi) Half velocity constant

(b) For a continuous flow stirred tank reactor without recycle write down the mass balance for substrate and biomass. **08**

OR

Q.5 **(a)** Write a short note on construction and working of a Trickling filter. Also explain the process of sloughing. **07**

(b) Explain anaerobic treatment process as a three stage process **07**

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