## GUJARAT TECHNOLOGICAL UNIVERSITY BE - SEMESTER-VI • EXAMINATION – WINTER 2013

Subject Code: 161304Date: 06-12-2013Subject Name: Biological Process for Wastewater TreatmentTime: 02:30 pm to 05:00 pmInstructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- **3.** Figures to the right indicate full marks.
- Q.1 (a) Explain the fate of the biodegradable organic matter during incubation in 07 the BOD test.
  - (b) Enlist the commonly used methods for estimating BOD kinetic 07 parameters. Explain any one in detail.
- Q.2 (a) Write a short note: Biochemistry of Carbohydrates 07
  - (b) If BOD<sub>5</sub> of a sample measured at 20 °C is 250 mg/L, determine the 3 day **07** BOD at 27 °C. Assume a reaction constant K' (to the base e) = 0.23 d<sup>-1</sup> at 20 °C and  $\Theta$  = 1.056.

## OR

- (b) Enlist unit operations and processes used to remove constituents found in 07 wastewater.
- Q.3 (a) Explain with a neat sketch packaged (pre-engineered) treatment plants.
  (b) Write a short note: Root zone treatment
  07

## OR

- Q.3 (a) Explain in detail anaerobic sludge digestion. 07
  - (b) Determine the amount of methane produced from 1 kg of BOD stabilized. 07
- Q.4 (a) Determine the values of bio-kinetic constants (K, K<sub>S</sub>, k<sub>d</sub>, Y and µ<sub>max</sub>) using 07 the data given in the following table derived from the laboratory experiments carried out with the fixed influent substrate concentration of 350 mg/L on CFSTR model of an activated sludge process without recycle:

Unit no.	Reactor	Detention	Reactor
	substrate	time,	biomass
	concentration,	$\Theta$ (days)	concentration,
	S (mg/L)		X mg/L
1	350	12	132
2	350	20	130
3	350	34	132
4	350	60	123
5	350	70	119

(b) Describe in brief classification of biological treatment processes.

OR

07

- Q.4 (a) Estimate the weight of net solids (sludge) produced per day in an activated 07 sludge aeration system in which the influent BOD is reduced from 250 to 30 mg/L. The flow, Q = 4000 m<sup>3</sup>/day; aeration tank volume = 700 m<sup>3</sup> and MLSS = 3000 mg/L. Assume: Y = 0.5, K<sub>d</sub> = 0.09/day. (i) Also compute sludge age  $\Theta_c$  and F/M. (ii) Find  $\Theta_c$  at which the final effluent BOD concentration S, will be 10 mg/L.
- Q.4 (b) Define: (1) Specific growth rate (2) Yield coefficient (3) Endogeneous 07 decay coefficient (4) Maximum substrate utilization rate constant
- Q.5 (a) Enlist the factors affecting the performance of aerators and describe 07 anyone in brief.
  - (b) Write a short note: Extended aeration 07

## OR

- Q.5 (a) Enlist the objectives of Biological treatment. 07
  - (b) With reference to attached growth process explain mass transfer 07 limitations.

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