

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

Subject Code: 161304**Date: 06-12-2013****Subject Name: Biological Process for Wastewater Treatment****Time: 02:30 pm to 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) Explain the fate of the biodegradable organic matter during incubation in the BOD test. **07**
- (b) Enlist the commonly used methods for estimating BOD kinetic parameters. Explain any one in detail. **07**

- Q.2** (a) Write a short note: Biochemistry of Carbohydrates **07**
- (b) If BOD₅ of a sample measured at 20 °C is 250 mg/L, determine the 3 day BOD at 27 °C. Assume a reaction constant K' (to the base e) = 0.23 d⁻¹ at 20 °C and $\Theta = 1.056$. **07**

OR

- (b) Enlist unit operations and processes used to remove constituents found in wastewater. **07**

- Q.3** (a) Explain with a neat sketch packaged (pre-engineered) treatment plants. **07**
- (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_S , k_d , Y and μ_{max}) using 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: **07**

Unit no.	Reactor substrate concentration, S (mg/L)	Detention time, Θ (days)	Reactor biomass concentration, 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. **07**

OR

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