

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – IV • EXAMINATION – SUMMER • 2013****Subject code: 741801****Date: 14-05-2013****Subject Name: Anaerobic Biotechnology****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) If the Acetic acid is the starting organic substance prove that 1 Kg COD stabilized will produce 0.35 m³ methane at STP. 06
- (b) With the help of a neat diagram explain anaerobic treatment process as four step activity. 06
- (c) Define anaerobic processes. 02
- Q-2(a) (i) If the hydrolysis is the rate limiting step in the anaerobic process, what steps you would suggest to increase the rate of conversion? 07
- (ii) Economics of the anaerobic treatment of waste water revolves around the utilization of methane. Justify the statement.
- (b) Enlist the environmental parameters to be maintained in anaerobic reactor for optimum operation stating the range values of each. Briefly explain the importance of following (i) Alkalinity (ii) Volatile acid concentration (iii) Temperature 07
- OR
- (b) (i) Briefly explain the role of hydrogen gas in anaerobic treatment. 04
- (ii) Anaerobic treatment is considered as a sequential process. Explain the statement. 03
- Q-3 (a) An anaerobic reactor is loaded with 1000 kg COD/day. The effluent COD is measured to be 200Kg/day. Estimate the biogas produced per day if the reactor operating temperature is 30°C. 07
- (b) (i) Explain the condition leading to the development of stuck reactor. Enlist and explain the steps which should be taken for their correction. 05
- (ii) Define sludge. 02
- OR
- Q-3(a) Enlist and explain the parameters indicating the balance condition in anaerobic reactor. 07
- (b) Enlist and explain any two sludge treatment processes. 07
- Q-4(a) Define High Rate Reactor with the help of appropriate example. 04
- (b) Classify the Anaerobic Biological Processes. Identify the anaerobic reactors under each class. 04
- (c) Determine the dimension of UASB reactor using the following data 06
- (i) Volumetric flow rate : 150 m³/day
- (ii) Inlet COD: 6000 mg/l
- (iii) Outlet COD: 1200 mg/l
- (iv) Operating temperature: 35 °C
- Assume the suitable design parameter and thumb rules to arrive at dimensions.
- OR
- Q-4(a) Draw a neat sketch of showing the arrangement of GLSS in the UASBR. Write briefly the working principle and importance of GLSS in the operation and design of UASBR. 07
- (b) The water content of sludge is reduced from 98 to 95 %. What is % reduction in volume by the approximate method and by the mere exact method, assuming that the solids contain 70% organic matter of specific gravity 1.0 and 30% mineral matter of specific gravity of 2.0. What is the specific gravity of 98 and 95 % sludge? 07
- Q-5(a) Draw neat sketches of 07
- (i) IC reactor
- (ii) AMBR
- Briefly explain the working principle of each.
- (b) Explain the following 07
- (i) Mechanisms of high biomass retention.

(ii) Hybrid anaerobic reactor and their application

OR

- Q-5(a) Write a short notes on any two: 08
- (i) Anaerobic reactors are unpopular
 - (ii) Acetic acid as the most important volatile acid in anaerobic reactor
 - (iii) Sources of methane in anaerobic reactor
- (b) With the help of a neat diagram explain the cation toxicity in the anaerobic reactor. Also discuss the ammonia toxicity. 06