Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject code: 1721806 Date: 02-01-2013

Subject Name: Environmental Modeling

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)** With the help of neat sketch , classify the lakes based on: **08**
(i) Temperature variations
(ii) Nutrient concentration

(b) Enlist and explain the objectives of environmental modeling. **06**

Q.2 **(a)** Enlist and explain the importance of conventional parameters in river modeling. **07**

(b) Differentiate between River modeling and Lake modeling. **07**

OR

(b) Derive the differential equation for the mass balance of water as a conservative substance with numerous inputs and outputs from a water body. **07**

Q.3 **(a)** Derive the Streeter Phelps equation for finding the DO deficit in a stream. **07**

(b) Enlist and explain the different types of Environmental models. **07**

OR

Q.3 **(a)** Write a note on "Waste load allocation" for a river. **08**

(b) Explain the two phenomena on which the transport of toxic chemicals in water principally depends. **06**

Q.4 **(a)** Derive the equation for finding the steady state concentration of a pollutant discharged in to a lake. **07**

(b) Write down the stoichiometric equation for finding the primary productivity in the lake. Highlight the importance of stoichiometry in the water quality management in lakes. **07**

OR

Q.4 **(a)** A municipal waste water treatment plant discharges treated effluent in to a surface stream. The flow rate of waste water is 10,000 m^3/day, BOD_5 of 40 mg/L, DO concentration of 2 mg/L and temperature of 20^0C. The stream (up stream from the point of waste water discharge) has a flow of 0.5 m^3/s, a BOD_5 of 3 mg/L, DO concentration of 6 mg/L and temperature of 20^0C.The deoxygenation constant is 1.23 d^{-1} & reaeration constant is 0.4 d^{-1}.Determine the critical DO deficit , assuming saturated DO concentration to be 9.1 mg/L (at 20^0C) **10**

(b) Write a short note on River Segmentation. **04**

Q.5 **(a)** Explain the stoichiometric equation for finding the primary productivity in the lake. What is the importance of stoichiometry in the water quality management in lakes. **08**

(b) Enlist and explain the types of equations used to find the growth rate of **06**

biomass in lakes and explain each type.

OR

Q.5 **(a)** Calculate the resulting growth rate in a lake from following data. The maximum growth rate under ideal conditions is 1.1/day. **07**

	NH_4+NO_3 as N	PO_4 as P
Concentration ,µg/L	60	7
Ks , µg/L	23	6

Based on (1) Growth rate and (2) stiochiometry, which nutrient is likely to be most limiting for the plankton growth?

(b) In a lake, it was observed that 0.4 µg per liter of phosphate was removed per day. Assuming the stoichiometric relationship for algal protoplasm, find out the nutrient uptake rate for nitrate and CO_2.Also estimate the rate of algal production in one month. **07**

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