Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014

Subject code: 1721806 **Date: 23-06-2014**

Subject Name: Environmental Modeling

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)** What are the conventional pollutants? Highlight the importance of each with the help of an example. **07**

(b) For a lake, it was observed that 0.4 µg per liter of phosphate was removed per day. Assuming stoichiometric ratio 16:1, estimate the nutrient uptake rate for nitrate and CO_2.Also estimate the rate of algal production in one month. **07**

Q.2 **(a)** What are the objectives of environmental modeling? **07**

(b) Derive the equation [Ce=W/Vϭ] for the steady state concentration of a pollutant in the lake. **07**

OR

(b) A tributary meets with a river. Calculate the initial concentration of dissolved oxygen, BOD of mix and temperature at the mixing point for use in D O model. **07**

River	Tributary
T =25.4 ^{0} C	T =26.9 ^{0} C
Cr=6.4 mg/L	Ct=7.3 mg/L
Lr=4.5 mg/L	Lt=5.8 mg/L
Qr=3000 m^3/d	Qt=450 m^3/d

Q.3 **(a)** Answer the following questions: **07**

1. Highlight the importance of modeling in the field of Environmental Engineering.
2. Differentiate giving examples between Conceptual, Theoretical and Empirical models.

(b) Define the terms calibration and verification relating to model. **07**

OR

Q.3 **(a)** Explain the mass balance of water in lakes assuming water to be a conservative substance. Hence calculate the volume of a lake over time if the sum of all inputs is 40m^3/s and outflows are 45 m^3/s and increasing 2m3/s every day due to evaporation and water demand. Initial volume of the lake is $0.5x10^9$ m^3. Estimate the time in days when there will be no water in the lake. **07**

(b) Explain the phenomena of stratification and overturn in lakes. **07**

Q.4	**(a)**	A city discharges 1.25 m^3/s of wastewater into a stream whose minimum rate of flow is 7.5 m^3/s .The velocity of the stream is about 2.5 Km/h. The BOD_5 of waste is 150 mg/L and that of stream is 2.0 mg/L. The wastewater contains no DO while the stream has a DO of 8.2 mg/L. At 20^0C kd is 0.3 /d and kr is 0.7/d. Determine the critical DO deficit and its location. Plot a graph of DO sag curve for next 7 days. Take saturated DO concentration at 20^0C as 10.2mg/L.	**10**
	(b)	Expalin the different biological zones of a lake.	**04**
		OR	
Q.4	**(a)**	Derive Streeter Phelps equation for finding DO deficit in a stream. Also enlist the assumptions made in its derivation.	**07**
	(b)	With the help of a neat sketch explain the elements in a mass balance using control volume concept.	**07**
Q.5	**(a)**	Give the classification of lakes based on the biological productivity.	**07**
	(b)	Prepare alist of degradation reactions in water and explain each.	**07**
		OR	
Q.5	**(a)**	Write short notes on: (i) Waste load allocation. (ii) River segmentation Give appropriate examples.	**07**
	(b)	Write a short note on ñSelf purification of streamsò. Write down the equations for deoxygenating and reaeration of streams.	**07**

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