Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME- SEMESTER II– EXAMINATION – SUMMER 2015

Subject Code: 2721806 **Date: 30/05/2015**

Subject Name: Environmental Modeling

Time: 2:30 PM – 5:00 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)**	Differentiate between Molecular diffusion, turbulent diffusion and dispersion for mass transport in aquatic environment.	**07**
	(b)	Enlist and explain the conventional pollutants in rivers.	**07**
Q.2	**(a)**	Derive the Streeter Phelps equation for finding DO deficit in stream.	**08**
	(b)	Explain the factors affecting DO reaeration kinetics. Highlight the role of temperature and stream velocity.	**06**
		OR	
	(b)	Enlist the sources of ground water contamination and explain the importance of ground water modeling.	**06**
Q.3	**(a)**	A stream has a velocity of 0.3048 m/s , a mean depth of 1.056 m and a deoxygentation rate constant of 0.6 day^{-1}.The initial ultimate BOD concentration at x=0 is 10 mg/L and initial DO deficit is 0 mg/L. Estimate (1) The reaeration rate constant using OôConnor ï Dobbins reaeration formula (2) Plot the DO deficit versus downstream distance for 8 values (3) Determine the critical deficit and its distance.	**08**
	(b)	Explain (i) NBOD (ii) Sediment Oxygen Demand	**06**
		OR	
Q.3	**(a)**	Write a short note on (i) Waste Load Allocation (ii) River Segmentation	**07**
	(b)	Explain uncertainty analysis related to environmental modelling	**07**
Q.4	**(a)**	Derive the equation for finding concentration of pollutant in lake at any instant of time t after disposal of waste in to the lake.	**10**
	(b)	Explain the phenomena of stratification and overturn of lake.	**04**
		OR	
Q.4	**(a)**	The out flow from a lake is controlled so that the lake level is approximately constant on an average basis. The annual rainfall is 0.5 m and evaporation from the lake is 0.7 m. Runoff to the lake is 0.2 m of water per year over a water shed area of 2000 Km^2. The phosphorus content of rain water is 0.02 mg/L. Phosphorus loss to sediments is a first order process with a constant of 0.002 /d. If the surface area and average depth of the lake are 100 Km2 and 15 m respectively, determine the phosphorus content of the lake at any time.	**10**
	(b)	Write a note on important biological zones of lakes.	**04**
Q.5	**(a)**	Enlist and explain the physical, chemical and biological processes that control the fate of pollutants dispersed in to the environment.	**07**

(b) Explain the terms **07**

(i) Aquifer
(ii) Aquitard
(iii) Capillary fringe
(iv) Hydraulic conductivity
(v) Permeability
(vi) Specific yield
(vii) Vadose zone

OR

Q.5 **(a)** Define the terms: **07**

(i) Simulation
(ii) Validation
(iii) Calibration
(iv) Verification
(v) State variable
(vi) Robustness
(vii) Model parameters

(b) Estimate the resulting growth rate for phytoplankton by Leibigs law of the minimum, Electrical resistance analogy and multiplicative algorithm methods for the following data if the maximum growth rate is 1.5 per day. **07**

	NH_4	PO_4-P	Si
S mg/L	0.02	0.004	1.6
Ks,mg/L	0.02	0.020	1.2

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