Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 08

M.Tech. Civil Engg. (Sem.–2)

WATER QUALITY MODELLING

Subject Code : MTCE-206

M.Code : 74299

Date of Examination : 13-12-22

Time : 3 Hrs. **Max. Marks : 100**

INSTRUCTIONS TO CANDIDATES :

1. **Attempt any FIVE questions out of EIGHT questions.**
2. **Each question carries TWENTY marks.**

1. Explain the steps involved in water quality modeling in ground water systems.

2. Write short notes on:

a) Gas transfer

b) BOD

c) Sediment oxygen demand.

d) Oxygen saturation

e) Pathogens.

3. A lake has the following characteristics:

Volume = 50,000 m^3. Mean depths = 4 m, Inflow = outflow = 8500 m^3 d^{-1} Temperature = 25° C

The lake receives the input of the pollutant from three sources a factory discharge of 60 kg d^{-1} a flux from the atmosphere of 0.7 g m^{-2} d^{-1}, and the inflow stream that has a concentration of 10 mg L^{-1}, if the pollutant decays at the rate of 0.25 d^{-1} at 20°C (0=1.05)

a) Compute the assimilation factor.

b) Determine the steady state concentration.

c) Calculate the mass per unit time for each term in mass balance.

4. Give brief description of the water quality models.

5. a) A pond having constant volume and no outlet has a surface area As and a mean depth H of 2m. It initially has a concentration of 0.8 ppm. Two days later a measurement indicates that the concentration risen to 1:5-ppm.

   i) What was the mass loading rate during this time?

   ii) If you hypothesize that the only possible source of this pollutant was from the atmosphere, estimate that the flux occurred?

   b) Explain stoichiometry and reaction kinetics.

6. To study the photo degradation of aqueous bromine, we dissolved the small quantity of liquid bromine in water, placed it in clear jar, and exposed it to sunlight. The following data were obtained:

t (min)	10	20	30	40	50	60
c (ppm)	3.65	2.85	1.65	1.34	0.92	0.62

   Determine whether the reaction is zero-, first-, or second-order and estimate the reaction rate?

7. a) What do you mean by response time?

   b) A pond with a single inflow stream has following characteristics:

   Mean Depth = 4m

   Surface area = 3×10^5 m^2

   Residence time = 2 wk.

   A subdivision will discharge raw sewage into this system. If BOD decays at a rate of 0.1 d^{-1} and settles at a rate of 0.1 m d^{-1}, calculate the 75%, 90 % and 95% response times for the pond.

8. Write a note on water quality analysis and explain the standards for water quality.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.