

**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE PILANI**  
**I SEMESTER 2017-2018**

CE F323

Introduction to Environmental Engineering

Dated: 12.10.2017

**Mid Semester Test (Open Book)**

Max. Marks: 70

Duration: 90 minutes

1. A river with 400 mg/l of salts (a conservative substance) and an upstream flow of 25 m<sup>3</sup>/s receives an agricultural discharge of 5 m<sup>3</sup>/s carrying 2000 mg/l of salt. The salts quickly become uniformly distributed in the river. A municipality just downstream withdraws water and mixes it with enough pure water ( no salt) from another source to deliver water having no more than 500 mg/l salt to its customers.  
What should be the mixture ratio of pure water to river water? (14)
  
2. A city has the following description Width=6 km , Length=16 km, wind velocity= 4 m/s , H=1000 m . The upwind or background concentration of carbon monoxide = 6 µg/m<sup>3</sup>. The emission rate per unit area = 5 x 10<sup>-6</sup> g/s. m<sup>2</sup>. The meteorological conditions described for the above data of city occur 30 percent of time (wind blows along the length). For the remaining 70 percent the wind blows at right angles to the direction discussed earlier at a velocity 6 m/s and the same mixing height. What is the annual average concentration of carbon monoxide in this city? (16)
  
3. Following data is given for economic sizing of turbulent flow settling chamber:
  - a. nWL and ΔH are fixed.
  - b. n , W and L are separately variable.
  - c. Material cost of the settling chamber is proportional to the surface area and thickness is same for all the sides.
  - d. Find out the following for the minimum surface area of settling chamber with respect to n and W :
    - (i) Relationship between length and width of chamber
    - (ii) Equation for the surface area of settling chamber

Where n is number of trays, W is the width of chamber, L is length of chamber, H is height of chamber and H= n ΔH. (20)
  
4. The BOD<sub>5</sub> of a sewage has been measured as 480 mg/l. If the base 10 rate constant k = 0.25 per day. What proportion of BOD ultimate remain unsatisfied after 20 days ? How BOD exertion depends upon de-oxygenation coefficient? Explain. (10)
  
5. (i) Compare the water quality of unconfined and confined aquifer. (6)  
(ii) Explain the break through curve and break through point in adsorption. (4)

**Paper ends**