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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -2 EXAMINATION - 2017
M.Tech I Semester

COURSE CODE: 14M31CE212 **MAX. MARKS: 25**
COURSE NAME: CONTAMINANT TRANSPORT
COURSE CREDITS: 03 **MAX. TIME: 1.5 Hr**

Q1. a) Derive a One-Dimensional Equation for an Instantaneous Point Release with suitable illustration. **[05 Marks]**

b) One gram of dye is injected into a long, thin tube and instantly mixes across the cross-section, A = 1cm^2. Water is pumped through the tube at Q = 0.1 cm^3/s. Assume that the flow is uniform across A. If the flow is laminar, assume a molecular diffusion coefficient, $D_M = 10^{-5}$ cm^2/s. Otherwise, assume D = 100 D_M. The concentration is measured at x = L = 100 cm downstream from the injection point. Estimate the length of the dye patch as it passes x = L and the maximum concentration experienced at this point. **[05 Marks]**

Q2. a) Write the transport equation using conservation of mass to define a steady state, one-dimensional solution for a continuous release. **[02 Marks]**

b) A small stream was found to be contaminated with Lindane, a pesticide known to cause convulsions and liver damage. Groundwater wells in the same region have also been found to contain Lindane, and so you suspect that river contamination is due to groundwater inflow. To test your theory you conduct a dye study. Based on the information given below, estimate the ground water volume flux,Q_{GW}, and the concentration of Lindane, C_{LGW}, in the ground water.

Station 1: A 50-mg/L solution of tracer is injected at the rate of Q_i =100cm^3/s

Station 2: Located 100-m downstream of Station 1.
Dye Concentration, C_{dye}= 10 µg/L
Lindane concentration, C_{L2} = 0.5 µg/L

Station3: Located 200 – m downstream of Station 1
Dye concentration, C_{dye} = 8 µg/L
Lindane concentration, C_{L3} = 0.9 µg/L **[05 Marks]**

Q3. a) Depending upon the spatial and temporal scale, when do you approximate the release to be: **[06 Marks]**
i) Continuous
ii) Point Source
Discuss on the choice of approximation of the source.

b) Write a note on "Peclet Number". **[02 Marks]**