JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2016

M.Tech I Semester

COURSE CODE: 14M31CE212   MAX. MARKS: 15

COURSE NAME: CONTAMINANT TRANSPORT

COURSE CREDITS: 03   MAX. TIME: 1 HR

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

Q1.a) What do you mean by "Material Balance" and how it is important in the analysis of fate and transport of a contaminant in the environment? **[02 Marks]**

b) Natural Dissolved Organic Material (DOM) concentration in the streams entering a 2×10^5 m^3 water reservoir averages 7mg/L; total annual inflow is 10^5 m^3. Due to evaporation, annual outflow of liquid water (via a dam and spillway, and a municipal water intake) is only 9×10^4 m^3, and DOM concentration in the outflow is 6.5 mg/L. What is the sink strength for DOM, expressed per cubic meter of water per day? **[03 Marks]**

Q2.a) Define "Flux Density". Discuss the role of turbulent diffusion in mass transport of a contaminant in the environment. How do you relate flux density with turbulent diffusion? **[03 Marks]**

b) What is the flux density of: **[02 Marks]**

i. Organic nitrogen (org-N) in a wastewater infiltration basin, if the org-N concentration is 10mg/L and water seeps into the soil at a rate of 2 cm/hr?

ii. CO_2 in an automobile exhaust pipe, where gas velocity is 30cm/sec and CO_2 concentration is 0.05g/L?

Q3.a) Discuss the factors on which molecular diffusion coefficient depends upon? **[02 Marks]**

b) Gasoline-contaminated groundwater has flowed under a residential dwelling from a nearby gasoline station. Two meters beneath the 100m^2 dirt floor of the residential basement, the concentration of hydrocarbon vapours in the soil air is 25 ppm on a mass/mass basis. Estimate the flux density of gasoline vapour and the daily rate of vapour transport into the basement by molecular diffusion. Assume an approximate diffusion coefficient of 10-2cm2/sec for gasoline vapour in the soil. Also assume the basement is well ventilated, so that the gasoline vapour concentration in the basement is much less than 25ppm. Air density is approximately 1.2g/1000cm^3 at 1 atm pressure and 20°C. **[03 Marks]**