ES3202

Endsemester Examination

Geotechnical Engineering

Spring 2019

1a. A pollutant is accidentally dumped in a lake. Through diffusion, the pollutant moves from the water to the atmosphere via an air-water interface. Draw a diagram showing how the concentration of the pollutant varies from the lake to the atmosphere. 8

1b. Derive an expression to calculate the flux of the pollutant from the lake to the atmosphere. 10

2a. Write the mass balance equation for variation of oxygen concentration with distance downstream in a river. Include all processes. 10

2b. Draw a diagram showing this variation, marking the deficits and concentrations. 6

3. A student collected two water samples from a river. The student has the equipment to measure the rate of oxygen consumption in the water. Design an experiment so that this student can calculate the rates of photosynthesis and respiration. 6

4. A simple way to model air pollution over a city is with a box model that assumes complete mixing. Consider a town having a 20 km distance perpendicular to the wind direction, a windspeed of 2 m/sec up to a height of 250 m. The carbon monoxide emission rate in the town is 60 kg/sec and is conservative. What is the carbon monoxide concentration in the box? 10

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