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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2018

B.Tech VIII Sem./M.Tech II Semester

COURSE CODE: 14M31CE216 **MAX. MARKS: 35**

COURSE NAME: HAZARDOUS WASTE MANAGEMENT

COURSE CREDITS: 03 **MAX. TIME: 2 Hr**

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

Q1.a) How do hazardous wastes affect humans and animals? Mention some of the impacts of illegal discarding of hazardous waste on environment. **[02 Marks]**

b) Under engineering classification, hazardous wastes are categorized as aqueous waste, organic liquids, oils and Sludges/solids. Give at least two examples of industrial operations under each category mentioned below from where the waste is generated: i) Organic liquids ii) oils and iii) Organic Sludges **[03 Marks]**

Q2. Write a note on: **[02+02+02 Marks]**

a) Volatilization of Chemicals in the environment

b) Fugitive dust emissions

c) Landfill Leachate

Q3.a) Discuss the functional differences between air stripping and steam stripping **[02 Marks]**

b) With the help of a neat figure, describe the functioning of a packed tower air stripper. What are the design considerations for a packed tower air stripper? **[03 Marks]**

Q4.a) What are the two forms of activated carbon? Mention their applications in Water/Wastewater treatment. **[02 Marks]**

b) Analyze the following reaction data and determine the order of reaction and rate constant

Time, min	0	12	24	36	48	60
C, mg/L	7.5	5.25	3.68	2.48	1.73	1.13

[03 Marks]

c) 200mL of a solution with a para-xylene concentration of 500mg/L is placed in each of six containers with activated carbon and shaken for 24 hours. The samples are filtered and the concentration of p-xylene measured, yielding the following analyses: **[04 Marks]**

Container:	1	2	3	4	5	6
Carbon, g	24	20	16	12	8	4
p-xylene(mg/L)	10.7	14.6	23	29	48	107

i. Determine the Freundlich constants K and n, and plot the isotherm.

ii. Using the above isotherm data, determine the amount of carbon required to treat 40,000 Litres/day of water contaminated with 500mg/L p-xylene. Assume a required effluent of 10mg/L and that the facility will operate at the same temperature and pH for which the isotherm was developed. Determine daily carbon usage for a batch reactor

Q5.a) Why in situ treatment processes are typically preferred for subsurface remediation over pump and treat processes? **[2.5 Marks]**

b) How organically modified clay helps in stabilization of hazardous waste **[2.5 Marks]**

c) 50,000 L/day of groundwater contaminated with 5000 mg/L of benzene and 10,000 mg/L of trichloroethylene (TCE) are fed to a system where air is being injected at a rate of 100,000 L/day. The influent air has no organic contaminants and does not react inside the system (i.e., no air dissolves in the water and no water is picked up by the air). The process takes place at 25°C, the same temperature of the influent groundwater and air. The benzene concentration in the effluent groundwater is 1000mg/L and the removal efficiency of TCE is 60 percent of the removal efficiency of benzene. Assume that the flow of groundwater and air does not change as a result of the process, and calculate the mass of benzene and TCE in the effluent air and groundwater streams. **[05 Marks]**