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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST II EXAMINATION (April - 2016)
M. Tech. (II- SEM.)

COURSE CODE: 14M31CE213   MAX. MARKS: 25
COURSE NAME: Industrial Wastewater Treatment
COURSE CREDIT: 3   MAX. TIME: 1.5 HRS

Note: Attempt all Questions. Carrying of mobile phones during exams will be treated as case of unfair means. Assume suitable data if required.

1. In context of acidic waste management, with neat sketches discuss the process of neutralization using (a) Equalization basin (b) Limestone bed (c) Limestone tower and (d) Lime slurries. In the context of alkaline waste management discuss (a) the chemicals generally used for neutralizing and (b) systems for neutralization. With a suitable graphical representation explain how the neutralization process is controlled. **(4+2+2)**

2. A highly acidic wastewater has a flow rate of 0.80 m^3/min and requires neutralization prior to secondary treatment. A two stage lime control process will be used with first stage lime usage of 1500 mg/l and second stage usage of 350 mg/l. Determine (a) the total lime requirement for the treatment process and (b) the volume of the neutralization tank if detention time is 10 minutes. **(2)**

3. Derive the expression: $A/S = 1.3C\ (fP-1)/C_i \times Q$ **(3)**

4. A wastewater flow of 0.50 m^3/min with 0.25N H_2SO_4 requires neutralization to pH 7 using a limestone bed. Assume limestone is 70% reactive. Variation of Hydraulic loading rate with limestone bed depth is shown in table below. Using the above information, determine (a) most economical bed depth (b) weight of acid per day to be neutralized and (c) annual requirement of limestone. **(3)**

Depth (m)	0.352	0.505	0.81	1.12	1.42
Hydraulic Loading (m^3/m^2.hr)	2.54	9.50	38.67	62.96	70.15

5. In a DAF system, it is required to maintain and A/S ratio of 0.03. The wastewater has a flow rate of 1600 m^3/d and an influent suspended solids concentration of 650 mg/l. The air solubility is 8.38, f = 0.6 and recycle pressure is 3 atm. Using the above information; determine the area requirement for the DAF system operating under recycling conditions. **(2)**

6. Find the quantity of sludge generated in a DAF system for removal of oil from 80 mg/l to 20 mg/l having a flow rate of 600 m^3/d. For removal purposes, alum is added at the rate of 40 mg/l and the rate of generation of sludge is 0.65 mg of sludge per mg of alum. Determine the volume of sludge generated if sludge has 4% solids concentration. **(2)**

7. Explain the methodology for equalizing **both** volume and strength in an equalization basin. **(2)**

8. Discuss some of the major undesirable waste characteristics of industrial wastes and their effects on receiving streams. **(3)**