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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST II EXAMINATION (MARCH/APRIL - 2017)

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 alkaline waste management, explain the neutralization process for such wastes. Treatment of alkaline wastes should often be done in stages. Discuss the statement with help of neat graphical representation. (2+2)
2. A highly acidic wastewater has a flow rate of $0.80 \text{ m}^3/\text{min}$ and requires neutralization prior to secondary treatment. A two stage lime control process will be used with overall lime consumption of 3000 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. Define the term Dissolved Air Floatation. In this context derive an expression for the same. (3.5)
4. Find the most economical bed depth for flow of $0.25 \text{ m}^3/\text{min}$ having $0.1 \text{ N H}_2\text{SO}_4$. Also determine (a) the weight of acid to be neutralized daily and (b) annual requirement of limestone (3)

| Depth (m) | 0.15 | 0.3 | 0.6 | 0.9 | 1.2 |
|---|------|-----|------|------|------|
| Hydraulic Loading ($\text{m}^3/\text{m}^2.\text{hr}$) | 1.7 | 7.3 | 34.6 | 58.6 | 65.1 |

5. A wastewater has flow of $0.6 \text{ m}^3/\text{min}$ at a temperature of 40°C and is primarily of oily nature. The influent concentration of oil is 150 mg/l and the effluent should be 15 mg/l . The alum dose applied is 70 mg/l with an absolute pressure of 520 kPa . The sludge produced has 5% weight by solids and sludge produced is 0.75 mg/mg of alum. Design a DAF system including (a) Recycle rate (b) Surface area of Floatation and (c) sludge quantity generated. Assume $f = 0.90$, weight of solubility of air at 40°C is 18.6 mg/l , $A/S = 0.03$ and SLR of 0.15 m/min (3)
6. With neat sketches and appropriate chemical reactions, discuss (a) precipitation technique and (b) chromium recovery using cementation methods for removal of heavy metals (3+3)
7. With a neat sketch, briefly explain the plate separator process for removing oily wastes. (3.5)