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

COURSE CODE: 14M31CE214

MAX. MARKS: 15

COURSE NAME: Process Design in Environmental Engineering

COURSE CREDIT: 3

MAX. TIME: 1 HR

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

1. Design a waste stabilization pond for a population of 150,000 having wastewater flow requirement of 300 lpcd. The BOD₅ consumption is 70gm/capita/day and SO₄⁻² concentration is 130 mg/l. The pH value varies between 7.5-8.0 and coliform measured is 10⁶/1000 ml. The effluent BOD₅ should not be greater than 50 mg/l. The latitude of the location is the 30°N and average radiation in Jan is 140 cal/cm²/day. The ambient winter and summer temperature is 17°C and 35°C respectively. The temperature of wastewater is 20°C. The oxygen production is 1.3 times algal production and unit heat of combustion is 6000 cal/gm. The value of η is 6%. Assume $L = 150 \text{ kg O}_2/\text{hect}/\text{day}$ and K_p at 20°C is 0.11. Assume pond temperature of 12°C. **(5)**
2. Design an aerated lagoon for a flow of 15000 m³/day having an influent SBOD₅ and suspended solids of 250 mg/l. The overall first order BOD₅ removal rate constant is 2d⁻¹ at 20°C. The ambient summer and winter temperature is 35°C and 15°C and the temperature of wastewater is 15°C. Assume $\theta = 1.07$, $\alpha = 0.90$, $\beta = 1.01$. The elevation is 1500 m and oxygen concentration to be maintained is 3 mg/l. The lagoon depth is 3 m and HRT is 12 days. Assume $f = 0.5$. The effluent SBOD₅ is 20 mg/l. Take $K_s = 100$, $K_d = 0.07$, $Y = 0.5$ and $K = 5$. **(5)**
3. Draw the flow sheets for different arrangements of treatment of pond system used for both restricted and unrestricted irrigation purposes. **(3)**
4. With a neat sketch, explain the working of the facultative stabilization pond. **(2)**