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

COURSE CODE: 14M31CE214   MAX. MARKS: 25
COURSE NAME: Process Design in Environmental Engineering
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. Design an oxidation ditch for a population of 50,000 having wastewater flow requirement of 150 lpcd. The BOD_5 generation is 45gm/capita/day and the TKN generation is 10gm/capita/day. The effluent BOD_5 should not be greater than 30 mg/l. The MLSS in the oxidation pond is 4000 mg/l and the F/M ratio to be maintained is 0.15. The depth of the ditch is 1.2 m and there are 4 ditches in parallel arrangement. The oxygen requirement is 2kg of O_2/kg of BOD_5 for the applied oxygenation capacity of 1 m length of rotor at 16 cm depth of immersion and 75 rpm. The rotor speed is 2.8 kg O_2/hr. Assume effluent suspended solid concentration is 20 mg/l and that 30% of suspended solid as BOD_5 contribution to total BOD_5 in the effluent.**(5)**

2. With neat flow sketches explain the following combined treatment systems (a) Trickling Filter followed by solids contactor (b) Roughing Filter followed by an ASP (c) Biofilter followed by an ASP and (d) Trickling Filter Followed by an ASP **(2.5x4 = 10)**

3. Design an RBC system for an influent domestic wastewater having a flow rate of 3000 m^3/d. The total BOD_5 of the influent is 250 mg/l and the $SBOD_5$ is 150mg/l. The effluent is desired to be $\leq$ 25mg/l. The temperature of incoming wastewater is 20^0C and the peaking factor is 3.5. Assume loading factor of 7.35kgSBOD/1000m^2/d, overflow rate on average flow conditions as 24.42 m/d and for peak flow conditions as 48.84 m/d **(3)**

4. Discuss the factors (a) Oxygen requirement and (b) Temperature Effects affecting the performance of Aerated Lagoon. **(2)**

5. Design an Earthen sedimentation basin to treat a flow of 3000 m^3/d having an influent and effluent suspended solids concentration of 298 mg/l and 20 mg/l respectively. Assume that cleaning period is after 4 years and that 70% of total solids discharged to basin are volatile are nature. **(2)**

6. A biotower composed of a modular plastic medium is used to treat a flow of 20,000 m^3/d with a BOD concentration of 150 mg/l. The treatability constant is 0.055/min at a temperature of 20^0C. Provide two towers each with a square surface separated by a common wall. The medium is to have a depth of 6.5 m and the recirculation ratio is 2. The desired effluent BOD_5 is 10 mg/l. The minimum temperature is expected to be 25^0C. Assume n = 0.5 and θ = 1.056 **(3)**