

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

MAKEUP EXAMINATION (April- 2018)

B.Tech (VIII –SEM)/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. With neat flow sketches where appropriate, explain the following in context of RBC systems (a) detailed process description of the system, (b) process performance analysis of an RBC system, (c) importance of staging configuration in an RBC and (d) Step feeding and Tapered feeding system (10)
2. Design an oxidation ditch for a population of 60,000 having an organic loading rate (5day at 20°C) of 80gm/capita/day. The sewage flow rate is 165 lpcd and desired effluent BOD₅ at 20°C is 25 mg/l. The organic loading rate in the ditch is 0.75 and depth of ditch is 1.8 m. Assume 5 ditches in parallel setup. The oxygen requirement is 3.5kg of O₂/kg of BOD₅. The applied oxygenation capacity of 1 m length of rotor at 16 cm depth of immersion and 80 RPM with a rotor speed of 4kg of O₂/hr (5)
3. Design an earthen sedimentation basin for a wastewater flow of 4500 m³/d having influent suspended solid concentration of 300 mg/l and effluent suspended solid concentration should be less than 20 mg/l. Assume 70% of total solids discharged to basin are volatile and the cleaning interval is 4 years. The HRT is 2 days and assume liquid depth is 1.5 m. Assume, the deposited solid will compact to 12% and density of accumulated sludge solids is 1.05 (3)
4. Design a biotower to treat a flow of 30000 m³/d with an influent BOD concentration of 250 mg/l. Assume the treatability constant to 0.085 per minute at a temperature of 20°C and the filter media constant can be assumed as 0.68. The depth of the medium is 6 m and the recirculation ratio is 2.2 during average flow concentrations. The treated effluent should have a BOD concentration of 15 mg/l and the temperature of wastewater is 35°C. Assume 3 treatment units to be provided. (4)
5. Determine the area and depth of waste stabilization pond for a population of 20,000 having wastewater flow requirement of 200 lpcd. The influent BOD₅ concentration is 300 mg/l. The effluent BOD₅ should not be greater than 25 mg/l. The latitude of the location is the 30°N and elevation is 1000 m above sea level. The maximum and minimum radiation is 160 and 110 cal/cm²/day respectively. The temperature of wastewater is 20°C. The oxygen factor is 1.6 times algal production and unit heat of combustion is 6000 cal/gm. The value of η is 6%. The sky clearance factor is 0.70 (3)