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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

END TERM (SUMMER SEMESTER EXAMINATION) July 2017

B.Tech(8th)/ M.Tech (2nd) Semester

COURSE CODE: 14M31CE214 MAX. MARKS:50

COURSE NAME: Process Design in Environmental Engineering

COURSE CREDITS: 03 MAX. TIME: 2 Hrs

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.* ***(Assume any other necessary data suitably)***

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1. Explain following: (a) Difference between Unit Operation and Unit Processes (b) Objectives of biological treatment (c) Types of sludge thickening (d) Enumerate advantages and disadvantages of anaerobic treatment of wastewater (e) Draw a schematic diagram of a sewage treatment plant using RBC as secondary treatment system for a town. **(10)**
2. Explain following: Difference between attached growth and suspended growth system (b) Objectives of wastewater treatment (c) Types of biological treatment processes with example (d) Enumerate advantages of treatability studies (e) Explain main variables of activated sludge process. **(10)**
3. Derive biomass mass balance and substrate balance equation of suspended growth system in a complete mix reactor without recycle. **(7)**
4. A flow of 20 L/min of water is to be treated in a plug flow reactor (PFR). What reactor volume (L) is needed to achieve 95% removal of a contaminant with a first order decay rate of 0.20 min^{-1}? Calculate the volume needed if the water is to be treated for 95% removal in an ideal complete mix flow reactor (CMFR). **(7)**
5. Enumerate various types of membrane modules and explain any one in detail. What is nitrification? Discuss effect of DO concentration and pH on suspended growth nitrification process. What are the objectives of tertiary treatment of wastewater? Explain the following terms related to membrane processes: (i) Penneate flow (ii) Membrane fouling (iii) Solute mass flux density (iv) Reverse osmosis. **(10)**
6. Design a complete mixing reactor system to serve 60000 people that will give a final effluent that is nitrified and as a five day BOD not exceeding 25 mg /l. The following design data is available: Sewage flow is 150 l/capita/day, influent BOD_5 is 54 g/capita/day, BOD_u is 1.47 times of BOD_5, TKN is 8 g/capita/day, Phosphorus 2 g/capita/day, winter temperature in aeration tank is 18 °C, Yield coefficient is 0.6, decay constant is 0.07 day^{-1}, specific substrate utilization rate K is 0.038 at 18 °C. (Assume any other necessary data suitably). Give the details of aeration tank, sludge production, return sludge quantity, details of digester design, sludge drying system, oxygen requirement, power requirement, sludge drying system. **(10)**