

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- May 2017

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

COURSE CODE: 14M31CE214

MAX. MARKS: 35

COURSE NAME: Process Design in Environmental Engg.

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)

1. What do you mean by Priority Pollutants and Refractory Organics? (1)
2. Derive an expression for concentration of contaminant in effluent from an ideal plug flow reactor using mass balance analysis. (2)
3. A staged RBC system is to be designed using following data: Inflow = 1000 m³/d, Influent BOD = 200 mg/L, Influent soluble BOD = 90 mg/L, Desired effluent BOD = 20 mg/L, Desired effluent soluble BOD = 10 mg/L, Permissible organic loading : 4 – 10 g sBOD/m².d and 8 – 20 g BOD/m².d, Maximum 1st stage organic loading: 12 -15 g sBOD/m².d and 24 – 30 g BOD/m².d, Hydraulic loading : 0.08 – 0.16 m³/m²/day. Disk surface area of standard unit: 9300 m². (6)
4. Draw RTD (Residence Time Distribution) curve for an ideal plug flow reactor. (2)
5. Why advanced oxidation process is preferred over conventional oxidation processes? (2)
6. Enumerate various types of membrane modules and explain any one in detail. (2)
7. What is nitrification? Discuss effect of DO concentration and pH on suspended growth nitrification process. (2)
8. A dispersed plug flow reactor has an influent flow 380 l/ minute with concentration of a contaminant 150 mg/l. The removal reaction is 1st order and rate constant k is 0.4 hr⁻¹. Determine required detention time and volume of reactor for 90 % removal of contaminant. (3)
9. Why methanogens compete with sulphate reducing bacteria during anaerobic treatment of wastewater? (2)
10. Explain the following terms related to membrane processes: (i) Permeate flow (ii) Membrane fouling (iii) Solute mass flux density (iv) Reverse osmosis (3)
11. What are the objectives of tertiary treatment of wastewater? Enumerate various tertiary treatment methods. (2)
12. 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 BOD₅ is 54 g/capita/day, BOD_u is 1.47 times of BOD₅, 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. (6)
13. "Total suspended solid test itself has no fundamental significance": Explain. (2)