

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST II EXAMINATION (June - 2016)

M. Tech. (II- SEM.)

COURSE CODE: 14M31CE214

MAX. MARKS: 35

COURSE NAME: Process Design in Environmental Engineering

COURSE CREDIT: 3

MAX. TIME: 2 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 RSF unit along with an under-drainage system for a population of 3 lakhs. The rate of water supply is 180lpcd and rate of filtration is 175l/min/m^2 . The quantity of backwashing water is 2% of the filtered water. The duration of backwashing is for 30 minutes. Each filter size is 6m x 10m. The numbers of standby filter units are 25% of the number of filters. (5)
2. Design an aeration system for a flow rate of $1000\text{m}^3/\text{d}$ with an initial BOD concentration of 300 mg/l. The size of the aeration unit is 32 x 10 x 3.5. The minimum aeration period is 14 hours and SOR is 1.8N. The total loss in air pipe is 3m and it is desired to produce 100% excess air. The air flow/diffuser is $1.5\text{ m}^3/\text{h}$. The efficiency of transfer of diffusers is 25%. The transfer rate by each diffuser is $0.12\text{kgO}_2/\text{hr}$. (4)
3. Design a nitrification reactor for wastewater having influent $\text{NH}_4 - \text{N}$ and BOD concentration of 65mg/l and 80mg/l respectively. The flow rate is $20,000\text{m}^3/\text{d}$ and the minimum DO required to be maintained in the tank is 2.8mg/l. The pH of the influent is 7.1 and the temperature of the influent is 16°C . Assume a safety factor of 2 and kinetic parameters of $\mu_m = 0.5/\text{d}$, $K_d = 0.04/\text{d}$, $K_s = 0.06/\text{d}$ and $Y = 0.3$ (4)
4. Design a trickling filter with a distribution system to treat a flow of $1.65\text{ m}^3/\text{s}$ with an influent BOD concentration of 180mg/l. The permissible effluent BOD concentration is 30mg/l. Assume a recirculation ratio of 3.0 and depth of filter as 2.0m. The minimum velocity in distributor arm is 0.75m/s. Use NRC approach. (6)
5. With a neat sketch explain the process of osmosis and reverse osmosis. Mention some of the applications and limitations of the reverse osmosis process. Discuss the membrane character generally used in reverse osmosis and draw the flow sheets for the single pass system and with recycle system. (2+2+2+2)
6. With appropriate diagrams and neat sketches, write short notes on (a) Plug Flow reactor (b) design of biotower (c) staging system in an RBC and (d) process performance analysis of RBC. (8)