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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST III EXAMINATION (May - 2018)

M. Tech. (II- SEM.)/B.Tech. (VIII- 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/m². The quantity of backwashing water is 4% of the filtered water. The duration of backwashing is for 40 minutes. Each filter size is 7m x 11m. The numbers of standby filter units are 25% of the number of filters. (7)
2. Design an aeration system for a flow rate of 1500m³/d with an initial BOD concentration of 350 mg/l. The size of the aeration unit is 35 x 12 x 3.5. The minimum aeration period is 15 hours and SOR is 1.85N. The total loss in air pipe is 3.5m and it is desired to produce 100% excess air. The air flow/diffuser is 2 m³/h. The efficiency of transfer of diffusers is 25%. The transfer rate by each diffuser is 0.12kgO₂/hr. (5)
3. Design a nitrification reactor for wastewater having influent NH₄ - N and BOD concentration of 80 and 100 mg/l respectively. The flow rate is 25,000m³/d and the minimum DO required to be maintained in the tank is 4 mg/l. The pH of the influent is 7.5 and the temperature of the influent is 18^oC. Assume a safety factor of 2.5 and kinetic parameters of $\mu_m = 0.5/d$, $K_d = 0.04/d$, $K_s = 0.06/d$ and $Y = 0.3$ (5)
4. Design a two stage trickling filter to treat a flow of 25 MLD with an influent BOD concentration of 380 mg/l. The permissible effluent BOD concentration is 25 mg/l. Assume a recirculation ratio of 2.5 and depth of filter as 2.0m. Assume efficiency of both the trickling filters is same. 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 explain the design aspects of the reverse osmosis system. (2+2+2+2)
6. Design an anoxic basin to treat a flow of 15MLD with an influent NO₃-N and NO₂-N concentration of 90 and 15 mg/l respectively. The desired efficiency of the system is 95% with a denitrification rate of 0.25d⁻¹. Assume DO concentration to be 0.75mg/l and temperature of wastewater as 20^oC with an MLVSS concentration of 3000 mg/l (4)