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SARDAR PATEL UNIVERSITY

M. Sc. -Integrated Biotechnology – Tenth Semester Examination
Saturday, 02nd April 2016
Time: 10:30 am to 01:30 pm
PS10CIGEB3: Environmental Engineering

Total Marks – 70

Q.1 Mark the right answer of following questions. **[08]**

1. _____ Langelier Saturation Index (LSI) has tendency to remove protective coating in pipelines.
   a. LSI > 0 **b.** LSI < 0 **c.** LSI = 0 **d.** LSI < 1 **e.** LSI > 1 **f.** None of these
2. _____ screen required relatively low headroom.
   a. Chain driven screen **b.** Reciprocating rake **c.** Catenary **d.** Continuous belt
3. _____ membrane technology can remove disinfection by products.
   a. Reverse osmosis **b.** Ultrafiltration **c.** Nanofiltration **d.** Microfiltration **e.** a & d
4. In biological nitrification _____ g of alkalinity as $CaCO_3$ is consumed per gram of $NH_4 - N$ oxidation.
   a. 7.14 **b.** 3.57 **c.** 1.42 **d.** 1.71 **e.** 4.57
5. If aeration tank has 1830g VSS/m^3 net biomass production rate, Substrate utilization rate is 6240g bs COD/m^3 & VSS production rate is 2012gVSS/m^3, find the active biomass fraction.
   a. 0.2932 **b.** 3.4098 **c.** 0.9095 **d.** 3.1013 **e.** 0.3224
6. Select an appropriate disadvantage of $Ca(OCl)_2$ from the following.
   a. Highly toxic **c.** Produce carcinogenic byproducts
   b. Affected by heat and light **d.** May clog pumps, piping and valves
7. From the following which one is NOT true about flow equalization process of ETP?
   a. Sludge thickening can be improved **c.** It requires relatively large land area
   b. It is an additional operation **d.** It increases shock loadings on biological process
8. _____ sedimentation tank is commonly used for primary treatment processes.
   a. Rectangular **b.** Circular **c.** Flocculator clarifier **d.** a & b **e.** a, b & c

Q.2 Answer the following questions. (ANY SEVEN OUT OF NINE) **[14]**

1. Write an objectives and applications of microfiltration and ultrafiltration.
2. What is the need of dewatering in waste treatment plant?
3. Which different categories of industrial wastewater have been decided by GPCB?
4. What is the need of advanced wastewater treatment processes? Write examples of it.
5. Define Flux, Scaling, Fouling and Permeate.
6. Give details of environmental factors which are affecting biological nitrification process.
7. Discuss the significance of treatment kinetic coefficients.
8. Write classification of chemical feeders.
9. Write the objectives and mechanisms of disinfection process in wastewater treatment.

Q.3 A. What are the significant observations normally used for biological phosphorus removal? Explain various activities of PAOs in biological phosphorus removal. [06]

B. In aerobic biological treatment process the influent wastewater bsCOD is $450g/m^3$ and flow rate is $900m^3/d$. The reactor effluent VSS and bsCOD concentrations are $150g/m^3$ & $20g/m^3$ respectively. Determine the amount of O_2 used per unit COD removal and calculate the general COD balance. [06]

OR

B. Determine biomass fraction in MLVSS and observed yield of the given complete mix activated sludge treatment process. The amount of nbVSS concentration and flow rate are $30g/m^3$ & $850m^3/d$ respectively. The biomass and reactor bsCOD concentration are $2500g/m^3$ & $30,000mg/m^3$ respectively. The volume of aeration tank is $110m^3$. If the cell debris fraction f_d and k_d is 0.10gVSS/gVSS, Y, k and K_s are 0.40gVSS/gCOD, 5g bsCOD/gVSS and $40g/m^3$ respectively. Write your comments on performance of ETP. [06]

Q.4 A. Why vacuum is required in MEE? Explain the process components and types of feed arrangement of Multi Effect Evaporator. [06]

B. Enlist the chemical agents used for disinfection process. Discuss disinfection process of Cl_2, NaOCl and $Ca(OCl)_2$. [06]

OR

B. Write classification of filtration process used in wastewater treatment process. Write a note on depth filtration technologies. [06]

Q.5 A. What is the difference between dewatering and sludge thickening? Outline various processes of sludge thickening. [06]

B. Draw well labeled diagram of each dewatering device and discuss advantages and disadvantages of various methods used for dewatering of sludge. [06]

OR

B. Writ short notes on: 1. Chemical neutralization [06]
2. Up gradation of software for ETP

Q.6 A. What are the objectives of screening? Describe advantages and disadvantages of mechanically cleaned screens. [06]

B. Illustrate development and measurement of surface charge, charge neutralization and polymer bridge formation. [06]

OR

B. Write short notes on: [06]
1. Applications, advantages and disadvantages of reverse osmosis
2. Objectives and process of electrodialysis in wastewater treatment

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