VIT

Final Assessment Test – April 2019

Course: CLE1006 - Environmental Engineering
Class NBR(s): 5247
Time: Three Hours

Slot: D2
Max. Marks: 100

PART – A (8 X 5 = 40 Marks)
Answer any EIGHT Questions

1. a) Determine the BOD_5 of wastewater and compute the ultimate BOD for the following sample. 5 ml of wastewater is diluted to 300 ml of distilled water in a standard BOD bottle. Initial DO in the bottle is 8.2 mg/l and DO after 5 days at 20° C is 4.5 mg/l. Suggest the wastewater could be discharged in water bodies. [3]

   b) State the drinking quality standards for any four physic-chemical parameters. [2]

2. Derive the first order reaction for Continuously-flow Stirred Tank Reactors (CSTR).

3. Discuss the concepts of mass balance used for wastewater treatment and list the steps involved in the preparation of mass balance.

4. A coagulation sedimentation plant clarifiers 40 million litre of water every day. The quantity of filter alum required for the plant is 18 mg/l and if the raw water is having an alkalinity equivalent to 5 mg/l of $CaCO_3$. Determine the quantity of filter alum and the quicklime required per year.

5. Explain different methods of chlorination process.

6. Design a grit chamber for population 50000 with water consumption of 135 LPCD. Assume necessary data.

7. What is the purpose of primary and secondary clarifier in wastewater treatment plant? Explain why the sludge from secondary clarifier is returned to aeration tank?

8. a) Explain the zones of pollution in River streams. [2]

   b) Explain the oxygen sag curve in a river receiving discharge of sewage with a neat diagram. [3]

9. What is the need for advanced treatment of wastewater? List various advanced treatment unit operations and their process.

PART – B (5 X 12 = 60 Marks)
Answer any FIVE Questions

10. a) The population of a town as per past census records are mentioned below. Forecast the population in the year 2021 using the following methods; [8]

    Arithmetical Increase method

    Geometrical Increase method

    Incremental Increase method

    If the per captia water demands are 135 lpcd estimate the demand for the year 2035

1961	1971	1981	1991	2001
39250	54390	68010	83630	99850

   b) List the factors to be considered in fixing the design periods for water supply components. [4]

Possession of Mobile Phone in the exam hall even in switched off condition is a malpractice.

11. a) Discuss the mechanism of azo dye removal through an activated carbon packed column. [6]

b) Design a rapid sand filter to treat 12 million litres of raw water per day. Assume necessary data. [6]

12. a) Draw schematic of the skimming tank and explain the removal mechanism of Fats, Oil and Grease (FOG). [6]

b) Design a rectangular sedimentation tank to treat 2 million litres of raw water per day with a detention period of 2.5 hours. Assume the necessary data required. [6]

13. a) An activated sludge plant is to be designed for 10 MLD domestic wastewater flow to operate at 10 days MCRT and 6 hours of HRT. Assuming BOD_5 20° C as 175 mg/l in influent to the aeration tank, sludge wasting flow equal to 70 m^3 /d and returned sludge concentration equal to 8000 mg/l, determine the concentration of MLVSS to be maintained in the aeration tank to achieve effluent BOD_5 of 30 mg/l. Also determine the recirculation ratio at which plant should be operated. Assume the kinetic coefficients $k_d = 0.06\ d^{-1}$ and y=0.6. [6]

b) Explain Upflow Anaerobic Sludge Blanket Reactor with a neat sketch. [6]

14. a) Design a Trickling filter to treat a domestic wastewater flow of 10 MLD having influent BOD_5 equal to 250 mg/l. [6]

The desired effluent BOD_5 is 25 mg/l.

b) With the help of neat flow diagram, Explain in detail about the various processes involved in sludge treatment and disposal process. [6]

15. a) Explain the application of Nano technology and biotechnology for wastewater treatments. [6]

b) Explain the sequence of unit operations and processes involved in the effluent treatment plant visited. [6]