

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 100602 Roll No.

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B.Tech.

(SEM. VI) THEORY EXAMINATION 2013-14

ENVIRONMENTAL ENGINEERING – II

Time : 3 Hours

Total Marks : 100

Note :- Attempt **all** questions. All symbols have usual meanings.

1. Attempt any **four** of the following : **(4×5=20)**
 - (a) The average sewage flow from a city is 80×10^6 L/d. If the average 5 day BOD is 285 mg/L. Compute the total daily 5 day oxygen demand in kg and the population equivalent of sewage. Assume per capital BOD of sewage per day = 75 g.
 - (b) Determine ultimate BOD for a sewage having 5 day BOD at 20°C as 160 ppm. Assume the deoxygenation constant as 0.2 per day. Determine 2 day BOD for the same sewage.
 - (c) Change in concentration of organic matter L, with time t, is given by $dL/dt = -KL$. Calculate the organic matter remaining after 4 days if the initial concentration was 300 mg/l and $K = 0.3$ per day.
 - (d) Write a note on various physical properties of wastewater.

- (e) For a wastewater sample, 5 day BOD at 20°C is 200 mg/l and is 67% of the ultimate. What will be the 4 days BOD at 30°C.
- (f) Differentiate between BOD, COD and THOD.
2. Attempt any **two** of the following : **(2×10=20)**
- (a) Why are coagulants used in the sewage treatment ? List various coagulants used along with their effectiveness in sedimentation of sewage.
- (b) Two million litres of water per day is passing through a sedimentation tank which is 6 m wide, 15 m long and having a water depth of 3 m :
- (i) Find the detention time for tank.
- (ii) What is the average flow velocity through the tank ?
- (iii) If 60 ppm is the concentration of suspended solids present in turbid raw water, how much dry solids will be deposited per day in the tank, assuming 70% removal in the basin, and average specific gravity of the deposit as 2.
- (iv) Compute the overflow rate.
- (c) Write short notes on the following :
- (i) Pressure filter
- (ii) Advantages and disadvantages of tube settlers/plate settlers
- (iii) Sludge blanket clarifier
- (iv) Backwashing in filters.

3. Attempt any two of the following : (2×10=20)

(a) Design a rapid sand filter, where

Design Discharge = 5.5

5% of filtered water for storage to meet the backwash requirement.

Each backwashing period is of 30 minutes.

Available surface area configuration of filter unit = 10 m × 4 m.

Filter size (total area provided) = 2 × 5 × 4 = 40 m sq.

Porosity of bed = 0.50, Specific gravity = 2.5, Average particle size = 0.6 mm.

Drag coefficient = 5.02, Expand the bed = 0.66 m from its original undisturbed depth = 0.6 m.

(Take a standard values wherever required).

(b) What is meant by “disinfection” in treating public water supply? What is its importance? What are the chemicals which are used as disinfectants and what are their comparative merits and demerits?

(c) Explain briefly the following processes :

(i) Break point chlorination

(ii) Super chlorination

(iii) Mention any one method of softening water.

4. Attempt any **two** of the following : (2×10=20)

- (a) The sewage flows from a primary settling tank to a standard rate trickling filter at a rate of 5 million litres per day having a 5 day BOD of 150 mg/l. Determine the depth and the volume of filter, adopting a surface loading of 2500 l/m²/day and an organic loading of 165 g/m³/day. Also, determine the efficiency of the filter unit, using NCR formula. (*Take standard values wherever required*).
- (b) What do you understand by the efficiency of a trickling filter ? How do you determine the efficiency, using :
 - (i) NCR formulae
 - (ii) Eckenfelder Equation ?
- (c) Discuss in brief the following :
 - (i) Rotating biological contactors with neat sketch
 - (ii) Conventional trickling filters with neat sketch

5. Attempt any **two** of the following : (2×10=20)

- (a) Discuss in brief Imhoff tanks. Design an Imhoff Tank for a town having population 17000 persons. The rate of sewage is 150 l/day. Assume suitably, any data not given.
- (b) Discuss septic tank and its design criteria. Also mention the problems and the solutions related to septic tank.
- (c) Discuss in brief, Up-flow anaerobic sludge blanket (UASB), Fluidized bed reactor, Expanded bed reactors and stabilization ponds with the help of neat sketch.