

(Time: 3 Hours)

[Total Marks: 80]

- N.B:** 1. Question No.1 is compulsory
 2. Attempt any **three** questions from remaining **five** questions.
 3. Assume any suitable data where ever required.
 4. Figures to the right indicate full marks.

Q.1 Attempt any **four**

- a. Differentiate between combined and separate system of sewerage. **05**
 b. Draw neat sketch of inverted siphon. **05**
 c. A 3% solution of sewage sample is incubated for 5 days at 20°C. The depletion of oxygen was found to be 3ppm. Determine the BOD of raw sewage. **05**
 d. Define F/M and Sludge age **05**
 e. Why oil and grease should be removed from waste water? Draw neat diagram of skimming tank. **05**

- Q.2** a. Describe the procedure for laying and testing of sewers. **10**
 b. State the routine tests carried out in the laboratories at sewage treatment and disposal works and explain the significance of each of them. **10**

- Q.3** a. What do you understand by self-purification property of a stream? Explain the factors affecting this property. **10**
 b. Design a high rate single stage trickling filter for treating the following wastewater of a town having a population of 40,000 persons: **10**
 a) Domestic sewage @ 150 lpcd having 200mg/lit of BOD
 b) Industrial wastewater @ 0.25million litres per day having 600mg/lit of BOD.

Assume the following:

- i) BOD removal in primary clarifier = 35%
 ii) Permissible organic loading of filter = 8000kg/hectare-m/day (excluding recirculated sewage)
 iii) Recirculation ratio = 1.0
 iv) Permissible surface loading = 160ML/hectare/day (including recirculated sewage)

Also, Determine the efficiency of the filter.

- Q.4** a. Enumerate the various methods which can be used for disposal of municipal solid waste and explain the two most widely adopted in India. **10**
 b. Differentiate between single pipe and single stack plumbing system with neat sketch. **10**

Q.5 a. Explain the working of Activated Sludge Process with neat sketch. Discuss the role of return sludge. **10**

b. Design the dimensions of a septic tank for the following data: **10**

No. of People=150

Sewage/capita/day=130lit

Desludging period=2years

Length: Width =4:1

Q.6 Write short note on (any four) **20**

a. Sludge thickener

b. Oxidation ditch

c. Recycling and reuse of waste water

d. Constructed wetland

e. Pumping station
