

B.E. (Civil)
ENVIRONMENTAL ENGINEERING - II
(2008 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from Section - I and Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from Section - II.*
- 2) Answers to the two sections should be written in separate books.*
- 3) Neat diagrams must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*
- 5) Use of logarithmic tables, slide rule, Mollier charts, non-programmable calculator and steam tables is allowed.*
- 6) Assume suitable data, if necessary.*

SECTION - I

- Q1) a)** A combined sewer of circular section is to be laid to serve a particular area. Calculate its size from the following data **[8]**

Area to be served = 100 hectares

Population = 90000

Maximum velocity of flow = 3 m per second

Time of entry = 3 minutes

Time of flow = 17 minutes

Rate of water supply = 240 litres per head per day

Impermeability factor = 0.50

Assume additional data where necessary.

- b)** Enumerate some of the appurtenances required for the pipes of wastewater collection system. **[4]**
- c)** Give and explain relationship between TOC, COD and BOD. **[4]**

OR

P.T.O.

- Q2)** a) Enlist and discuss the significant physical, chemical and biological parameters to characterize wastewater. [6]
- b) The BOD of sewage incubated for one day at 30°C has been found to be 200 mg/L. What will be 5 day BOD at 20°C? Assume $K = 0.12$ (base 10) at 20°C. [6]
- c) State what you understand by treatment of wastewater. [4]
- Q3)** a) Explain the meaning of disposal of sewage by land treatment and describe the actions involved in it. [6]
- b) What is self purification of natural waters and actions involved in self purification. [6]
- c) Give effluent standards of the following to be discharged on surface water bodies as per BIS [4]
- BOD.
 - COD.
 - Temperature.
 - TSS.

OR

- Q4)** a) Describe the grit chambers with special reference to their purpose, location nature of grit and number. [6]
- b) Design a primary clarifier for a town having a population of 34000. The formation of sewage may be assumed at 150 litres per capita per day. [6]
- c) Discuss the broad classification of sewage treatment processes. [4]
- Q5)** a) Write neat diagram, explain the various phases of microbial life cycle. [9]
- b) 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 m³/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 $K_d = 0.06\text{d}^{-1}$ and $Y = 0.6$. [9]

OR

- Q6) a)** A low rate trickling filter has a diameter of 40 m and a depth of 1.5 m. Assuming the waste removal rate constant as 1.90 d^{-1} and filter media constant $n = 0.67$ and using the Eckenfelder equation, determine treatment efficiency of the trickling filter for a waste water flow of 2 MLD having 200 mg/L BOD_5 . [9]
- b)** Write short note on following: [9]
- i) RBC.
 - ii) Organic loading.
 - iii) F/M ratio.
 - iv) Volumetric loading.
 - v) HRT.
 - vi) MCRT.

SECTION - II

- Q7) a)** Write in details design parameters of aerated lagoon and mention the advantages and disadvantages of the same. [8]
- b)** Assuming suitable criteria, design an oxidation ditch to treat 1 MLD flow of sewage with an influent BOD_5 of 200 mg/L to have the desired effluent BOD_5 of 20 mg/L . [8]

OR

- Q8) a)** Clarify the difference between the aerated lagoon and the oxidation ditch with respect to process design. [8]
- b)** What are waste stabilization ponds? Describe the removal mechanism of waste stabilization ponds. [8]

- Q9)** a) Classify the anaerobic biological treatment system. Enlist the units under each group. [8]
- b) Design a septic tank for small colony of 500 persons with average daily sewage flow 100 lot per head per day. [8]

OR

- Q10)** a) Draw and explain UASB Reactor with principal, advantages and disadvantages. [8]
- b) How does the anaerobic digestion works? Explain various steps involved in it. [8]
- Q11)** a) Explain equalization and neutralization. [6]
- b) Explain the necessity of Industrial effluent treatment. [6]
- c) Explain manufacturing process, wastewater generation, methods of treatment of sugar industry. [6]

OR

- Q12)** a) Give difference between grab sample and composite sample. [6]
- b) Draw and explain flow chart of treating distillery wastewater. [6]
- c) Write short note on Pulp and paper mill waste and textile waste. [6]

