

Total No. of Questions : 10]

SEAT No :

P2949

[Total No. of Pages :3

[5154]-501

B.E.(Civil)

ENVIRONMENTAL ENGINEERING-II
(2012 Course) (End Sem.) (401001) (Semester-I)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8 and Q.9 or Q.10.
- 2) Figures to the right indicate full marks.
- 3) Draw neat figures wherever necessary.
- 4) Assume necessary data.
- 5) Use of scientific calculators is allowed.

Q1) a) Differentiate between separate and combined sewerage system. [5]

b) Explain the procedure for determination of BOD. [5]

OR

Q2) a) What are the sources of sewage and how sewage flow quantity is estimated? [5]

b) Explain the procedure for determination of COD. [5]

Q3) a) Determine diameter and depth of primary sedimentation tank for sewage flow 10 million liters per day. [5]

Given data.

i) Detention time = 2.5 hours

ii) Surface loading rate = 40000 l/m²/d

b) Write Streeter-Phelps equation, explain the terminology and write its application. [5]

OR

P.T.O.

Q4) a) An average operating data for conventional activated sludge treatment plant is as follows **[2+2+2]**

- | | | |
|------------------------------------|---|-------------------------|
| i) Sewage flow | = | 30000 m ³ /d |
| ii) Volume of aeration tank | = | 10500 m ³ |
| iii) Influent BOD | = | 200 mg/l |
| iv) Effluent BOD | = | 20 mg/l |
| v) Mixed liquor suspended solids | = | 3000 mg/l |
| vi) Effluent suspended solids | = | 30 mg/l |
| vii) Waste sludge suspended solids | = | 9500 mg/l |
| viii) Quantity of waste sludge | = | 200 m ³ /d |

Determine.

- 1) Food to microorganisms ratio
 - 2) Sludge age
 - 3) Percentage of efficiency of BOD removal
- b) Differentiate between single stage and two stage filter. **[4]**

Q5) a) Design an oxidation pond for following data **[8]**

- i) Location : 24° Latitude
- ii) BOD loading at 24° Latitude : 225 kg/ha/d
- iii) Elevation : 900 m above sea level
- iv) Mean monthly temperature : 30° maximum and 15° minimum
- v) Population to be served : 10000
- vi) Sewage flow : 100 lpcd
- vii) Desired effluent BOD₅ : 20 mg/L
- viii) Pond removal constant at 20°C : 0.1/d

- b) Write wastewater treatment principle of phytoremediation technology and explain its working with schematic sketch. **[4+4]**

OR

Q6) a) A wastewater flow is 10000 m³/d, BOD₅ is 200 mg/L, design an aerobic flow through type lagoon to serve a town of 50000 persons, using a ideal complete mixing model. Since the lagoon is proposed to be followed by another treatment unit, its size can be restricted to give a detention time of only 3 days. **[8]**

Given data

$$k=0.015 \text{ per day at } 20^{\circ}\text{C}, Y = 0.5, k_d = 0.07 \text{ per day}$$

- b) Write wastewater treatment principle of root zone cleaning system and explain its working with schematic sketch. **[4+4]**

- Q7)** a) Draw a neat sketch of upflow sludge blanket (UASB) reactor. Explain the principle of working and its advantages and disadvantages. **[2+2+4]**
- b) The sludge is known to be 70% organic and 30% inorganic in nature. Approximately 60% of the organic fraction is converted to liquid and gaseous end products after a 30 day period. The digested sludge has a solids content of 5% and must be stored for periods of up to 85 days. Determine the volume of requirement for a standard rate single stage digester. The raw sludge loading rate is 80 m³/d. **[8]**

OR

- Q8)** a) Write principle and stages of anaerobic digestion. Explain factors affecting digestion process. **[4+4]**
- b) Explain any two methods of sludge disposal with advantages, disadvantages and application. **[4+4]**
- Q9)** a) Explain methods of waste water sampling. **[6]**
- b) Write short note on equalization and neutralization. **[6]**
- c) Draw and explain units of treating dairy wastewater. **[6]**

OR

- Q10)** a) Explain the following points related to sugar industry. **[4+3+3]**
- i) Flow sheet of manufacturing process and wastewater generation
- ii) Characteristics of wastewater
- iii) Flow sheet of wastewater treatment
- b) Explain in brief primary and secondary treatment process adopted for treating industrial wastewater. **[4+4]**

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