[6003]-337

T.E. (Civil)
WASTE WATER ENGINEERING
(2019 Pattern) (Semester-II) (301012)

Time : 2½ Hours]   *[Max. Marks : 70*

Instructions to the candidates:

1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
2) *Figures to the right indicate full marks.*
3) *Draw neat figures wherever necessary.*
4) *Assume suitable data if necessary.*
5) *Use of scientific calculators is allowed*

Q1) a) Explain the importance of secondary treatment and principle of biological treatment. **[6]**

b) An average operating data for conventional activated sludge treatment plant is as follows. **[6]**

Sewage flow-30000 m³/d, volume of aeration tank-10500m³, influent BOD-200mg/L, effluent BOD-20 mg/L, mixed liquor suspended solids-3000 mg/l, effluent suspended solids-30 mg/L, Waste sludge suspended solids-9500mg/L, quantity of waste sludge-200m³/d. Determine

i) Food to microorganism ratio

ii) Sludge age

iii) Percentage of efficiency of BOD removal

c) Describe symptoms, causes and remedial measures of sludge bulking in activated sludge process. **[6]**

OR

Q2) a) Explain the term Volumetric BOD loading, F/M Ratio, Sludge age in detail.**[6]**

b) The mixed liquor suspended solids. Concentration in aeration tank is 3000 mg/l and sludge volume after 30 minutes of settling in a 1000 ml graduated cylinder is 135 ml. Determine. **[6]**

i) SVI

ii) Required return sludge ratio

iii) Suspended solids concentration in recirculated sludge

c) Describe symptoms, causes and remedial measures of foaming in activated sludge process. **[6]**

Q3) a) Summarize the principle components and factors affecting oxidation pond design. **[5]**

b) Design an oxidation pond for the following data. Raw sewage flow-10 MLD, raw sewage BOD_5-200mg/L, desired BOD_5 of treated effluent-20mg/L, BOD removal rate constant-0.1/d, BOD loading rate for the given latitude of the place-250kg/Ha/d, elevation of the place-550 m above MSL. Determine. **[6]**

i) Area of oxidation pond

ii) Detention time required

iii) Dimension of the pond

c) Enumerate principle, advantages and disadvantages of aerated lagoon.**[6]**

OR

Q4) a) Explain with a neat sketch the principle of trickling filter. **[5]**

b) A single stage trickling filter is designed for an organic loading of 10000 kg of BOD in raw sewage per hectare meter per day with a recirculation ratio of 1.1. This trickling filter treats 1.95 MLD of raw sewage with a BOD of 180mg/L. Use NRC formula and determine the strength of the effluent. **[6]**

c) Describe the operational problems and its control in trickling filter. **[6]**

Q5) a) Compare the aerobic and anaerobic treatment of wastewater. **[6]**

b) Design a septic tank for 300 users. Water allowance is 120 L per head per day. Assume suitable data if required. **[6]**

c) Describe with a neat sketch working of up-flow anaerobic sludge blanket reactor. **[6]**

OR

Q6) a) Summarize the features and applications of up-flow anaerobic sludge blanket. **[6]**

b) Design the dimensions of septic tank for small colony of 160 persons provided with an assured water supply from municipal head works at the rate of 120 L per person per day. Assume suitable data if required. **[6]**

c) Explain the merits of sequential batch reactor over conventional activated sludge process. **[6]**

Q7) a) Describe the governing factors in anaerobic digesters. **[5]**

b) Sedimentation tank is treating the flow of 5 MLD containing 275 ppm of suspended solids. Tank removes around 50% of suspended solids. Calculate the quantity of sludge produce per day in bulk and weight if **[6]**
i) Moisture content of the sludge is 98%

ii) Moisture content of the sludge is 96%

c) Explain the stages of digestion in anaerobic digesters. **[6]**

OR

Q8) a) Indicate the major challenges in sludge management. **[5]**

b) The moisture content of a sludge is reduced from 95% to 80%. Find the decrease in the volume of the sludge. Explain why dewatering of sludge is necessary. **[6]**

c) Discuss the reuse opportunities of wastewater in industrial sector. **[6]**

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