P727

[5870]-1011

T.E. (Civil)

WASTE WATER ENGINEERING

(301012) (2019 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Assume suitable data if necessary.*
5) *Use of scientific calculators is allowed.*

Q1) a) Explain the purpose of biological treatment of wastewater? **[4]**

b) Explain the term Aeration period (H.R.T.), Volumetric BOD loading, F/M Ratio, Sludge age in detail. **[7]**

c) An average operating data for activated sludge treatment plant is as follows **[7]**

  i) Wastewater flow = 35000 m³/day

  ii) Volume of aeration tank = 10900 m³

  iii) Influent BOD = 250 mg/lit

  iv) Effluent BOD = 20 mg/lit

  v) MLSS = 2500 mg/lit

  vi) Effluent suspended solids = 30 mg/lit

  vii) Waste sludge suspended solids = 9700 mg/lit

  viii) Quantity of waste sludge = 220 m³/day

 Calculate

  1) Aeration period (hrs)

  2) F/M ratio

  3) % efficiency of BOD removal

  4) Sludge age (days)

P.T.O.

Q2) a) Explain difference between suspended growth and attached growth process. **[4]**

b) Draw flow diagram of activated sludge process and explain its working. **[7]**

c) An average operating data for conventional activated sludge treatment is as follows. **[7]**

  i) Wastewater flow 20500 m³/d

  ii) Volume of aeration tank - 3500 m³

  iii) Influent BOD - 300 mg/lit

  iv) BOD removal from primary sedimentation tank - 30%

  v) Effluent BOD - 10 mg/lit, mixed liquor suspended solids - 2500 mg/lit. Determine aeration period (hrs), food to microorganism ratio, percentage efficiency of BOD removal.

Q3) a) Explain the aerated lagoon with respect to its working principle and applications. **[3]**

b) Design an oxidation pond for treating sewage from residential colony with 5000 persons, contributing sewage @ 120 lit per capita per day. The 5-day BOD of sewage is 300 mg/lit. **[7]**

c) Explain the construction and working of oxidation pond with neat labeled sketch. **[7]**

Q4) a) What is phytoremediation and root zone technology? **[3]**

b) Explain the construction and working of Trickling filter with labeled sketch. **[7]**

c) Determine the size of High-Rate Trickling Filter for the following data. **[7]**

  i) Sewage flow = 4.5 MLD

  ii) Recirculation ratio (R/I) = 1.5

  iii) BOD of raw sewage = 250 mg/lit

  iv) BOD removal in primary sedimentation tank = 30%

  v) Final effluent BOD desired = 30 mg/lit

Q5) a) Explain Up-flow anaerobic sludge blanket reactor UASBR with neat sketch. **[4]**

b) Explain the construction and working of Septic Tank. **[7]**

c) Design the dimensions of septic tank for small colony of 150 persons provided with an assured water supply from municipal head works at the rate of 120 lit per person per day. Assume suitable data required.**[7]**

OR

Q6) a) Write shorts notes on tretiary treatment of waste water. **[4]**

b) Explain the working of Sequential batch reactor (SBR) and Moving bed bio reactor (MBBR) in detail. **[7]**

c) Explain the working of Fluidized membrane bioreactor (FMBR) and membrane bio reactor (MBR) in detail. **[7]**

Q7) a) Write the different techniques for dewatering of sludge? **[3]**

b) Draw a neat sketch of single stage anaerobic digester and explain its working. **[7]**

c) Sedimentation tank is treating the flow of 4.5 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 **[7]**

i) Moisture content of the sludge is 98%

ii) Moisture content of the sludge is 96%

OR

Q8) a) What are the advantages of grey-water recycling? **[3]**

b) Explain driving forces for recycling and reuse of waste water. **[7]**

c) Discuss the reuse opportunities of wastewater in municipal, industrial and agricultural sectors. **[7]**

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