

Total No. of Questions : 8]

SEAT No. :

PD4217

[Total No. of Pages : 3

[6403]-11

T.E. (Civil)

WASTE WATER ENGINEERING
(2019 Pattern) (Semester - VI) (301012)

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 with neat sketch the principle and working process of activated sludge process. [2+3]

b) Explain the term Aeration period (H.R.T), Hydraulic retention time (HRT), BOD Loading Rate (VLR) and F/M ratio in detail. [5]

c) Design of conventional activated sludge treatment plant for an average operating data is as follows: [8]

Wastewater flow=34000m³/d

Volume of aeration tank=10600m³

Influent BOD=250 mg/l

Effluent BOD=20mg/l

Mixed liquor suspended solids = 2500mg/l

Effluent suspended solids =30mg/l

Waste sludge suspended solids 9700mg/l

Quantity of waste sludge=220m³/d

Based on the information above determine,

- i) Aeration period(hrs)
- ii) Food to microorganism ratio (F/M ratio)
- iii) Percentage efficiency of BOD removal
- iv) Sludge age (days).

OR

P.T.O.

Q2) a) Explain difference between suspended growth and attached growth process. [5]

b) Define sludge bulking. Explain the control measures for the sludge bulking. [5]

c) An average operating data for conventional activated sludge treatment plant is as follows: [8]

Sewage flow = 35000 m³/day

Volume of aeration tank = 12000 m³

Influent BOD = 250 mg/lit

Effluent BOD = 20 mg/lit

Mixed liquor suspended solids 2800 mg/lit

Effluent suspended solids = 30 mg/lit

Waste sludge suspended solids = 9700 mg/lit

Quantity of waste sludge = 220 m³/d

Determine:

- i) Aeration period
- ii) Food to microorganism's ratio
- iii) Percentage of efficiency of BOD removal
- iv) Sludge age.

Q3) a) Explain with neat sketch the construction and working of oxidation pond. [5]

b) Explain the aerated lagoon with respect to its working principle and applications. [5]

c) Design an oxidation pond for a colony of 3500 population. The sewage flow is 120lit/person/day. BOD₅ is 300mg/l. Assume necessary required data. [7]

OR

- Q4)** a) Explain the construction and working of trickling filter with neat sketch. [5]
b) What is phytoremediation and root zone technology. [3]
c) Determine the size of a high rate trickling filter for the following data: [9]

Sewage flow 5 MLD

Recirculation ratio = 1.5

BOD of sewage = 200 mg/l

BOD removed in primary sedimentation tank = 30%

Final effluent BOD = 20 mg/l

Depth of filter = 2 m.

- Q5)** a) Explain with neat sketch the construction and working of septic tank. [8]
b) Compare the aerobic and anaerobic treatment of waste water. [5]
c) Difference between secondary treatment and tertiary treatment of wastewater. [5]

OR

- Q6)** a) Explain working of Sequential batch reactor (SBR) and Moving bed bio reactor (MBBR) in detail. [6]
b) Design a septic tank for 330 Users. Water allowance is 130 liters per head per day. Also design a suitable soil absorption system if the percolation rate is 3 mm/cm and depth of ground water table below GL is 1.5 m. [8]
c) Write short notes on tertiary treatment of waste water. [4]

- Q7)** a) Explain the construction and working process of anaerobic digestion tank. [5]
b) Write a note on sludge thickener. [5]
c) Explain any two methods employed for the sludge disposal along with advantages and disadvantages. [7]

OR

- Q8)** a) Write a short note on grey water recycling. [5]
b) Discuss the waste water reuse opportunities in municipal industrial and agricultural sectors. [7]
c) Write a short notes on sludge drying beds. [5]

