Total No. of Questions : 8]

SEAT No. :

PE-2477

[Total No. of Pages : 3

[6583]-1
T.E. (Civil)
WASTE WATER ENGINEERING
(2019 Pattern) (Semester - VI) (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) ***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 working process of activated sludge process. **[5]**

b) Explain the term sludge volume index(SVI), hydraulic retention time(HRT), BOD LoadingRate (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=32000 m^3/d

Volume of aeration tank = 10500m^3

Influent BOD=250 mg/l

Effluent BOD=20mg/l

Mixed liquor suspended solids=2500mg/l

Effluent suspended solids=30mg/1

Waste sludge suspended solids = 9700mg/l

Quantity of waste sludge=220m^3/d

Based on the information above determine,

i) Aeration period

ii) Food to microorganism ratio (F/M ratio)

iii) Percentage efficiency of BOD removal

iv) Sludge age(days)

OR

P.T.O.

Q2) a) Define sludge bulking. Explain the control measures for the sludge bulking. **[5]**

b) With the help of diagram explain the microbial growth pattern in batch and continuous systems. **[5]**

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

Sewage flow = 4000 m^3/day
Volume of aeration tank = 15000 m^3
influent BOD = 250 mg/lit
Effluent BOD = 20 mg/lit
Mixed liquor suspended solids = 3000 mg/lit
Effluent suspended solids = 30 mg/lit
Waste sludge suspended solids =9700 mg/lit
Quantity of waste sludge = 220 m^3/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) Enumerate principle, advantages and disadvantages aerated lagoon. **[5]**

c) Design an oxidation pond for a colony of 4000 population. The sewage flow is 120 lit/person/day BOD_5 is 300mg/l. Assume necessary required data. **[7]**

OR

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

b) Determine the size of a high rate trickling filter for the following data : **[9]**

Sewage flow = 4.5 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.

c) Define the terms phytoremediation and root zone technology. **[3]**

Q5) a) Explain with neat sketch the construction and working of septic tank. **[9]**

b) With neat sketch explain anaerobic lagoon with advantages and disadvantages. **[9]**

OR

Q6) a) Explain working principle and applications of SBR and MBR. **[9]**

b) Design a septic tank for 350 Users. Water allowance is 150 liters per head per day. Also design a suitable a suitable soil absorption system if the percolation rate is 4 min/cm and depth of ground water table below GL is 1.5 m. **[9]**

Q7) a) Explain the construction and working process of anaerobic digestion tank. **[5]**

b) Write a note on gobar gas plant. **[5]**

c) Explain the various 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]**

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