Total No. of Questions : 8]

SEAT No. :

PC1695

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T.E. (Civil Engineering)

WASTE WATER ENGINEERING

(2019 Pattern) (Semester- II) (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) ***Figure to the right indicate full marks.***
4) ***Assume Suitable data if necessary.***
5) ***Use of scientific calculator is allowed.***

Q1) a) Define Sludge Volume Index (SVI). What is bulking of sludge. Enlist any two measure to control bulking of sludge. **[6]**

b) Explain: **[6]**

i) Mean cell residence time (MCRT),
ii) Hydraulic loading
iii) F/M ratio

c) An average operating data for activated sludge treatment plant is as follows: **[6]**

i) Waste water flow = 42000 m^3/day.
ii) Volume of aeration Tank = 15000 m^3.
iii) Influent BOD = 300 mg/l.
iv) Effluent BOD = 30 mg/l.
v) MLSS = 2700 mg/l.
vi) Effluent Suspended Solids = 30 mg/l.
vii) Waste sludge suspended solids = 9800 mg/l.
viii) Qty. of waste sludge = 230 m^3/day

Calculate:

1) Aeration Period
2) F/M ratio and
3) % BOD Removal Efficiency

OR

P.T.O.

Q2) a) Draw flow diagram of activated sludge process and explain its working. **[6]**

b) Explain the suspended growth process and attached growth process with two examples of each. **[6]**

c) An average operating data for conventional activated sludge treatment is as follows: **[6]**

i) Waste water flow 22600 m^3/day.

ii) Volume of aeration tank - 4800 m^3.

iii) Influent BOD - 300 mg/lit.

iv) BOD removal from primary sedimentation tank - 30%.

v) Effluent BOD - 15 mg/lit.

vi) Mixed liquor suspended solids - 2500 mg/lit.

Determine aeration period (hrs), food to microorganism ratio, percentage efficiency of BOD removal.

Q3) a) Explain - bacteria-algae symbiosis with the help of neat labelled sketch. **[5]**

b) Explain - oxidation pond with the help of neat labelled sketch, also write any two advantages & disadvantages. **[6]**

c) Design an oxidation pond for treating sewage from a small town with 7000 persons, contributing sewage @ 126 lit per capita per day. The 5-day BOD of sewage is 290mg/lit. **[6]**

OR

Q4) a) Explain the working principle of aerated lagoon with neat labelled sketch. **[5]**

b) Explain following. **[6]**

i) Phytoremediation

ii) Root zone technology

c) Determine the size of High-Rate Trickling Filter for the following data. **[6]**

i) Sewage flow = 6 MLD.

ii) Recirculation ratio (R/I) = 1.5

iii) BOD of raw sewage = 260 mg/lit.

iv) BOD removal in primary sedimentation tank = 30%

v) Final effluent BOD desired = 30 mg/lit.

Q5) a) Explain working of Sequential batch reactor (SBR). Explain Steps involved. **[6]**

b) Explain the working of Fluidized membrane bioreactor (FMBR) and Packed bed reactor (PBR). **[6]**

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. **[6]**

OR

Q6) a) Explain the construction and working of Septic Tank. **[6]**

b) Explain Up-flow anaerobic sludge blanket reactor UASB reactor with neat sketch. **[6]**

c) Explain following nutrients removal processes: **[6]**

i) Adsorption

ii) Ion exchange

iii) Membrane processes

Q7) a) Write a short note on recycling of grey water. **[5]**

b) Draw a neat sketch of single stage anaerobic digester and explain its working. **[6]**

c) State the challenges in sludge management. Explain any two. **[6]**

OR

Q8) a) Enlist the different techniques for dewatering of sludge? Explain any two. **[5]**

b) Explain reuse opportunities in each municipal, industrial & agricultural sector. **[6]**

c) Design the sludge digestion tank with the following data: **[6]**

i) Average flow of sewage = 65 MLD

ii) TSS in raw water sewage = 340 mg/l

iii) Volatile suspended solids (VSS) = 250 mg/l

iv) Moisture content in digested sludge = 88%

v) Removal of SS from PST = 65%

vi) Moisture content in fresh Sludge = 95%

vii) Digestion Period = 42 days