

Total No. of Questions : 8]

SEAT No. :

PB3753

[Total No. of Pages : 3

[6262]-11

T.E. (Civil Engineering)

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) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right indicates full marks.
- 4) Assume suitable data, if necessary and clearly state.
- 5) Use of cell phone is prohibited in the examination hall.
- 6) Use of electronic pocket calculator is allowed.

Q1) a) Explain the term with respect to activated sludge process. **[6]**

- i) Hydraulic Retention Time (HRT),
- ii) Solid Retention Time (SRT),
- iii) Mixed Liquor Suspended solids (MLSS),
Food to microorganism ratio (F/M ratio)

b) An aeration tank of Volume 2000 m³ treating 10000 m³/day of Waste water with influent BOD 150 mg/l aimed to reduce BOD to 30 mg/l. Find F/M ratio used in the design. Take MLSS : 3000 mg/l **[4]**

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

A	Wastewater flow	20000 m ³ /d
B	Volume of aeration tank	3000 m ³
C	Influent BOD	200 mg/l
D	BOD removal from primary sedimentation tank	30%
E	Effluent BOD	10 mg/l
F	MLSS	2000 mg/l

Based on the information determine

- i) Aeration period (hour)
- ii) E/M ratio
- iii) Percentage efficiency of biochemical oxygen demand removal.

OR

P.T.O.

Q2) a) Conventional activated sludge plant is designed for a town to treat settled domestic sewage with diffused air aeration system for the given data as follows [6]

- i) Population of town: 1 lakh
- ii) Per capita sewage contribution: 100 lpcd
- iii) Settled sewage BOD = 100 mg/l
- iv) Effluent BOD desired = 10mg/l
- v) MLSS in aeration tank = 3000mg/l
- vi) $F/M = 0.2$

Find

- 1) BOD loading in Kg/d,
 - 2) Aeration tank volume
 - 3) Volumetric loading in kg BOD/m³.
- b) Write short note on Rotating Biological Contractors (RBC). [4]
- c) What do you understand by biological treatment of wastewater? List the different types of microorganisms and explain their role in wastewater treatment. [8]

Q3) a) Explain wastewater treatment principle of phytoremediation technology with neat sketch and give its application. [9]

- b) A town having a population of 1.2 lakhs is producing sewage at a rate of 100 lpcd having 200 mg/l of BOD. A trickling filter having recirculation ratio 1.5 is design to produce effluent of BOD 20mg/l. The operating depth of filter is 2.5m. Find the diameter of the trickling filter is m. [9]

OR

Q4) a) Determine the size of a high-rate trickling filter for the following data; [9]

- i) Sewage flow = 8 MLD
 - ii) Recirculation ratio = 1.5
 - iii) BOD of sewage = 230 mg/l
 - iv) BOD removed in primary sedimentation tank = 30%
 - v) Final effluent BOD = 20 mg/l
 - vi) Depth of filter = 3 m
- b) What are Oxidation ponds? Explain the bacteria - algae symbiosis with a neat sketch. [9]

- Q5) a)** Design a septic tank for 290 users. Water allowance is 120 L per head per day. Assume suitable data if required. [9]
- b)** Explain the working principle with neat sketch of following terms with the advantages and applications: [9]
- i) Packed bed reactor (PBR),
 - ii) Sequential batch reactor (SBR)

OR

- Q6) a)** Explain the working principle with neat sketch of following terms with the advantages and applications: [3+6]
- i) Up-flow Anaerobic Sludge Blanket (UASB)
 - ii) Moving bed bio reactor (MBBR)
- b)** Explain with a neat sketch the working of a septic tank. Design a septic tank for 300 users. Water allowance is 120 L per head per day. Assume suitable data if required. [3+6]

- Q7) a)** Write a short note on sludge drying bed. [5]
- b)** What is a Sludge? Why Sludge digestion is necessary. In activated sludge process, 1 MLD (by volume) of secondary sludge has to be returned to keep the required MLSS concentration in the aeration tank. This sludge has a water content of 99%. If the sludge water content is reduced to 98%, what volume of the sludge will be needed to be recycled? [7]
- c)** Explain what do you understand by primary and secondary sludge. [4]

OR

- Q8) a)** Explain the anaerobic sludge digestion process. Write a short note on sludge drying bed. [5]
- b)** Sedimentation tank is treating the flow of 5 MLD containing 300 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 97%
 - ii) Moisture content of the sludge is 95%
- c)** Explain what do you understand by primary and secondary sludge. [4]

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