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Roll No.

B. TECH
(SEM VI) THEORY EXAMINATION 2017-18
ENVIRONMENTAL ENGINEERING - II

Time: 3 Hours ***Total Marks: 100***

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

a. What are the impacts of oxygen demanding waste on surface water bodies?
b. What is Theoretical Oxygen Demand (ThOD)?
c. What are the objectives of grit removal?
d. What do you understand by back washing?
e. What is the significance of GLSS in UASB?
f. What is the role of acetogenic bacteria in anaerobic digestion?
g. Distinguish between unit operations and unit processes.
h. What is the significance of solids retention time in extended aeration process?
i. What is the role of algae in aerobic pond?
j. What are the major factors influencing settling of discrete particles?

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

a. What is an indicator organism? Discuss the characteristics of the ideal pathogen indicator and indicate which organisms most nearly exhibit these characteristics.
b. Why are coagulants used in the sewage treatment? List various coagulants used along with their effectiveness in sedimentation of sewage.
c. **(i)** Discuss advantage and disadvantage of soda lime process and ion exchange methods of water softening.
(ii). What is adsorption? Explain term 'activated' associated with Activated Carbon.
d. Design a conventional grit chamber unit for a design sewage flow of 120ML/d. Assume suitable-data wherever necessary. Draw a schematic diagram of the unit.
e. Design a septic tank with neat sketch for a hostel having 175 students. Design sewage flow is 70 Lpcd. Desludging period is one year. What would be the size of the dispersion trench, if the effluent from the septic tank is to be discharged in it?

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

(a) **(i.)** What is carbonaceous BOD? How the probable interference of Nitrogenous oxygen demand is inhibited during BOD measurement?
(ii). Change in concentration of organic matter L, with time t, is given by dL/dt = –KL. Calculate the organic matter remaining after 4 days if the initial concentration was 300 mg/l and K = 0.3 per day.

(b) Enumerate and explain the physico-chemical characteristics of waste water.

4. Attempt any *one* part of the following: 10 x 1 = 10

(a) Design a plain sedimentation tank for an average flow of water 250 m^3/hr. The minimum size of particle to be removed 0.02 mm and expected performance of tank may be taken as 'good'. Kinematic viscosity of water at 20^0 C = 1.01×10^{-6} m^2/s and specific gravity of particle = 2.65.

(b) Design a clariflocculator for an average flow of water 250 m^3/hr. Assume any data suitably if required.

5. Attempt any *one* part of the following: 10 x 1 = 10

(a) Design a rapid sand filter for producing a net filtered water flow of 300 m^3/hr. The other relevant data are as follows :

Quantity of backwash water used	=	4% of filter output
Time lost during backwashing	=	30 min
Design rate of filtration	=	5 m^3/m^2/hr
Length to width ratio	=	(1.25 to 1.33): 1
Under drainage system	=	Central manifold
Size of perforations	=	9 mm.

(b) A rapid sand filter has a bed depth of 0.7 m. It is composed of sand grains that have a specific gravity of 2.65 and shape factor of 0.82. The porosity of the bed is 0.45 throughout' The sieve analysis of the sand is shown below :

Sieve No.	Mass retained (%)	Average particle size(mm)
1	0.87	1.0
2	8.63	0.71
3	21.30	0.54
4	28.10	0.46
5	23.64	0.38
6	7.09	0.32
7	3.19	0.27
8	2.16	0.23
9	1.02	0.18

Determine the head loss through the bed if the flow rate is 5.0 m/s and water temperature is 17°C.

6. Attempt any *one* part of the following: 10 x 1 = 10

(a) The thickened sludge of 100 m^3/d is processed in a standard rate anaerobic digester. The moisture content of thickened sludge is 95%. The digestion period is 25 days and the sludge must be stored for 3 months between final disposal events during monsoon period. Organic content of the sludge is 70 percent and 60 percent of the organics are converted into gaseous and liquid end products The solid content of the digested sludge is 4.5%. Determine the required reactor volume. Assuming 100 kg/m^2/yr solids loading rate, design the number of sludge drying beds required for dewatering operation.

(b) Briefly describe the classification of trickling filters. Explain the mechanism of biofilm formation and mass transfer in a tricking filter process with a neat sketch.

7. Attempt any *one* part of the following: 10 x 1 = 10

(a) Write short notes on duckweed pond, vermiculture and root zone technologies.

(b) What is sludge digestion? What are two basic types of sludge digestion units? Also name and describe methods of sludge disposal.