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15CV71

Seventh Semester B.E. Degree Examination, July/August 2021
Municipal and Industrial Wastewater Engineering

Time: 3 hrs.   Max. Marks: 80

Note: *Answer any FIVE full questions.*

1 a. Define Sewage. Explain Combined Sewerage system, with its merits and demerits.
        (08 Marks)

b. Using Rational method, determine the discharge for a storm water drain.
Area of catchment = 100 hectare ; Intensity of rainfall = 50mm/hr.
Details of catchment area as follow :

Type of Area	Percentage area	Impermeability Coefficient
Roots	15	0.9
Pavements	20	0.8
Lawns and Gardens	40	0.15
Unpaved	15	0.20
Wooded	10	0.05

Also, if the population density in the area is 350 persons per hectare and rate of water supply is 200 ℓpcd. Calculate design discharge for combined system. Take Q_{peak} flow = 2.0.
        (08 Marks)

2 a. Define Sewer Appurtances. List out the various types of appurtances provided in the sewerage system.   **(05 Marks)**
b. What are the basic principles of house drainage system?   **(05 Marks)**
c. Explain with a neat sketch, construction and working function of a septic tank.   **(06 Marks)**

3 a. Briefly explain the factors affecting the self purification of stream water.   **(10 Marks)**
b. A town has a population of one lakh with a per capita sewage flow as 300 ℓpcd. Design a sewer running full depth at peak discharge. The sewer is to be laid at a slope of 1 in 625. Take Manning's constant N as 0.013 and peak factor as 3.   **(06 Marks)**

4 a. Discuss in detail the process of deoxygenation and reoxygenation, with respect to self purification of natural water bodies with a neat sketch of oxygen sag curve.   **(08 Marks)**
b. A city with a population of one lakh and a sewage flow of 125 ℓpcd is located on a stream with a rate of flow of $0.7m^3$/sec. The BOD of sewage is 200 mg/ℓ. The DO and BOD content of the stream above the outfall sewer are 7mg/ℓ and 1mg/ℓ respectively.
i) How many kg of oxygen per day are available above the outfall?
ii) What is the total kg of BOD per day in the stream just below the outfall (assume no oxidation). Express the total BOD in mg/ℓ.   **(08 Marks)**

5 a. Explain with a flow diagram, a conventional sewage treatment plant. Discuss the function of each component.   **(08 Marks)**
b. Design a continuous flow rectangular primary sedimentation tank fitted with mechanical sludge cleaning equipment for treating the sewage from a city having a population of 80,000 persons which has an assumed water supply rate of 100 ℓpcd. Assume the maximum flow to be 1.4 times the average flow. The necessary design parameters may be suitably assumed.
        (08 Marks)

6 a. Determine the size of a high rate trickling filter for the following data :
Sewage flow = 4.5 MLD ; Recirculation ratio = 1.4 ; BOD of raw sewage = 250mg/ℓ
BOD removal in primary classifier = 25% ; Final effluent BOD desired = 50mg/ℓ.
Also calculate size of the standard rate trickling filter to accomplish the above requirement.
(08 Marks)

b. With a neat sketch, explain the construction details and working of sludge digestion tank.
(08 Marks)

7 a. Discuss the effect of Industrial Wastewater on water bodies. **(08 Marks)**

b. What is meant by Strength Reduction? Explain various methods of strength reduction of Industrial wastewater. **(08 Marks)**

8 a. Explain briefly the method for the removal of inorganic solids from Industrial wastewater.
(08 Marks)

b. Explain the methods used for Neutralization and Equalization of Industrial wastewater.
(08 Marks)

9 a. With a flow diagram, explain the treatment of Tannery waste. **(08 Marks)**

b. Enumerate the effect of discharging paper and pulp Industrial waste into water bodies or sewage. **(08 Marks)**

10 a. With process flow diagram, explain the origin of wastewater from cane sugar mill. List its characteristics. **(08 Marks)**

b. With the help of flow diagram, explain different treatment alternatives for pharmaceutical industrial wastewater. **(08 Marks)**

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