

CBCS SCHEME

15CV71

USN

| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|

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 |
|-------------------|-----------------|----------------------------|
| Roofs | 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 ℓ pcd. Calculate design discharge for combined system. Take $Q_{\text{peak flow}} = 2.0$.

(08 Marks)

- 2 a. Define Sewer Appurtenances. List out the various types of appurtenances 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 ℓ pcd. 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 ℓ pcd is located on a stream with a rate of flow of $0.7\text{m}^3/\text{sec}$. The BOD of sewage is 200 mg/ℓ . The DO and BOD content of the stream above the outfall sewer are 7 mg/ℓ and 1 mg/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 ℓ pcd. 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)
