

CBCS SCHEME

15CV71



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Seventh Semester B.E. Degree Examination, Aug./Sept.2020 Municipal and Industrial Waste Water Engineering

Time: 3 hrs.

Max. Marks: 80

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Draw neat sketches wherever necessary.
3. Assume suitable data wherever necessary.

Module-1

- 1 a. Discuss briefly types of Sewerage System. (05 Marks)
b. Explain the various types of materials used for sewer construction. (05 Marks)
c. Compute the population served, drainage area and diameter of storm water sewer (outfall) for the following data:

For Sanitary sewer:

"Flowing full" discharge = $0.02 \text{ m}^3/\text{s}$

"Design" discharge (per capita) = $1.5114 \text{ m}^3/\text{person}/\text{day}$

For Drainage area and Outfall sewer:

Population density = 75 persons per hectare

Coefficient of runoff = $C = 0.278$ (for area, A in km^2)

Intensity of rainfall = 107 mm/hour (Based on 10 year rainfall frequency curve and time of concentration = 20 minutes)

Velocity of flow in storm sewer = 3.0 m/s (Discharge measured in m^3/s). (06 Marks)

OR

- 2 a. Explain with a neat diagram Drop Manhole. (05 Marks)
b. Illustrate the working principle of oxidation pond as a Low Cost Treatment Method. (05 Marks)
c. A city has three streams carrying waste water with discharges of 350 MLD, 300 MLD and 250 MLD. $\text{BOD}_{5d, 20^\circ\text{C}}$ of streams are 300 mg/L, 290 mg/L and 270 mg/L respectively. Compute the BOD loading (total) in tons per annum. If TSS/BOD Ratio = 1.3, determine total TSS loading. (06 Marks)

Module-2

- 3 a. A 3m diameter circular sewer discharges $3 \text{ m}^3/\text{s}$ of sewage into a pump well. The waste water level in the pump well rises to full depth of 3 m above invert of incoming sewer.. Assuming Manning's value of 0.012 and gradient of 0.5/1000 determine the velocity of flow and ratio of discharge (q) to full discharge ($Q_{\text{full}} = 10.856 \text{ m}^3/\text{s}$). (05 Marks)
b. Explain the self purification of streams with a Sag curve. (05 Marks)
c. Discuss the various flow-friction formulae used in design of sewers. (06 Marks)

OR

- 4 a. Find out where critical DO occurs in a fully saturated river (with DO) for the following data:
City discharge = $100 \text{ m}^3/\text{s}$
Minimum river discharge = $1250 \text{ m}^3/\text{s}$; Minimum velocity in river = 0.15 m/s
 $\text{BOD}_{5d, 20^\circ\text{C}} = 260 \text{ mg/L}$; Coefficient of purification of river = 4.0
Coefficient of DO = 0.11
Ultimate BOD = 125% of BOD of mixture of sewage and river water. (05 Marks)

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- b. Explain the term "Zone of Purification" in a river. (05 Marks)
c. Derive the Streeter-Phelps Oxygen Sag equation in river analysis. (06 Marks)

Module-3

- 5 a. Explain the various waste water characteristics. (05 Marks)
b. Distinguish between Grab sampling and Composite sampling. (05 Marks)
c. Draw a neat flow diagram of a domestic sewage treatment plant showing various unit operations and unit processes and briefly explain. (06 Marks)

OR

- 6 a. Explain with a neat sketch working of a Trickling filter. (05 Marks)
b. Distinguish between suspended growth and fixed film biological processes. (05 Marks)
c. Design a set of two rectangular primary settling tanks for type-I settling of sewage for an average flow of 20000 m³/d, design SOR of 40m³/m².d. Draw a neat sketch of the same. Assume peak flow = 2.5 times average flow check whether the design ensures safety against re-suspension if max. scour velocity = 0.06 m/s. (06 Marks)

Module-4

- 7 a. Discuss the effect of effluent discharge on streams. (05 Marks)
b. Explain the terms volume reduction and strength reduction of industrial waste water. (05 Marks)
c. How is shock loading on treatment plants prevented using equalization and proportioning. (06 Marks)

OR

- 8 a. Explain the advantages and disadvantages of combined treatment of industrial waste with domestic waste water. (05 Marks)
b. Discuss the methods of removal of "inorganic solids" from industrial waste water. (05 Marks)
c. Explain the methods of maintaining quality in a stream using effluent and stream standards. (06 Marks)

Module-5

- 9 a. Explain the effect of dairy waste on receiving streams and give a treatment proposal. (05 Marks)
b. Explain the treatment of cane sugar effluent with the help of a flow chart. (05 Marks)
c. Explain the role of anaerobic stabilization ponds as energy efficient method of treating distillery waste. (06 Marks)

OR

- 10 a. Give the schematic flow diagrams of cotton textile industry showing the generation of wastewater. (05 Marks)
b. Give the typical characteristics of Indian tannery industrial waste water. (05 Marks)
c. Tuna fish canning industry is proposed near the coast. What are the expected operations leading to discharge of waste? Also give the treatment strategy. (06 Marks)

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