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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 m^3/s
    "Design" discharge (per capita) = 1.5114 m^3/person/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. $BOD_{5d,\ 20°C}$ 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 m^3/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_{full} = 10.856 m^3/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 m^3/s
    Minimum river discharge = 1250 m^3s ;   Minimum velocity in river = 0.15 m/s
    $BOD_{5d,\ 20°C}$ = 260 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)**

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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