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**PRESIDENCY UNIVERSITY  
BENGALURU**

**SCHOOL OF ENGINEERING  
END TERM EXAMINATION - JUN 2023**

**Semester :** Semester VI - 2020

**Course Code :** CIV3035

**Course Name :** Sem VI - CIV3035 - Waste Water Treatment and Disposal Systems

**Program :** CIV

**Date :** 16-JUN-2023

**Time :** 9.30AM -12.30PM

**Max Marks :** 100

**Weightage :** 50%

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**Instructions:**

- (i) Read all questions carefully and answer accordingly.
  - (ii) Question paper consists of 3 parts.
  - (iii) Scientific and non-programmable calculator are permitted.
  - (iv) Do not write any information on the question paper other than Roll Number.
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**PART A**

**ANSWER ALL THE QUESTIONS**

**(6 X 5 = 30M)**

1. The surface on which rain falls in a district is classified as follows: 20% of the area consists of roofs for which the runoff ratio is 0.9, 20% of the area consists of pavements for which the runoff ratio is 0.85, 5% of the area consists of paved yards of houses for which runoff ratio is 0.8, 15% of area consists of macadam roads for which runoff ratio is 0.40, 35% of the area consists of lawns, gardens and vegetable plants for which the runoff ratio is 0.10 and the remaining 5% of the area is wooded for which the runoff ratio is 0.05. The total area of the district is 36 hectares and the max rain intensity is 5cm/hr. What is the total runoff for the district?  
(CO1) [Knowledge]
2. Sludge thickening or dewatering is adopted for reducing the volume of sludge and increasing the solid contents. Write the benefits of sludge thickening.  
(CO3) [Knowledge]
3. Disposal by dilution is the simple method of discharging wastewater into a surface water such as a river, lake, ocean, estuaries or wetlands. This results in the pollution of the receiving water. The degree of pollution depends on the dilution, volume and composition of the wastewater as compared to the volume and quality of the water with which it is mixed. List the conditions which are favorable for the disposal of raw or untreated sewage by dilution.  
(CO3) [Knowledge]
4. We need the characteristics and examination of sewage before designing any sewage treatment system to work efficiently. Write down the various characteristics of sewage.  
(CO1) [Knowledge]

5. One of the step of preliminary treatment consists of removal of dead animals, tree branches, papers, plastics, wood pieces, vegetables peels etc. In relation to this define screen and list the types of screens used in waste water treatment.  
(CO2) [Knowledge]
6. Trickling filters (TFs) are used to remove organic matter from wastewater. What are the different types of trickling filters?  
(CO2) [Knowledge]

## PART B

### ANSWER ALL THE QUESTIONS

(5 X 10 = 50M)

7. In sludge thickeners, greater amount of water is removed from the sludge than what could obtain from sedimentation tank. This reduces overall volume of the sludge considerably. The thickening of the sludge can be achieved either by gravity thickening, application of air floatation or by centrifugation. Explain Gravity thickening.  
(CO3) [Comprehension]
8. Design a screen device for a flow of 25MLD with approach velocity 1 m/sec. Assume depth of flow as 0.9 m, size of opening is 25 mm and diameter of bars = 10 mm. Also find the head loss through screen device. The bars are provided with an inclination 60 degrees to horizontal.  
(CO2) [Comprehension]
9. A town has a population of 36000 with the daily per capita water supply allowance being 135 litres, of which 80% finds its way to sewer. The slope available for the sewer to be laid is 1 in 625 and sewer should be designated to carry four times the dry weather flow when running full. Estimate the velocity and diameter of the sewer when running full?  
Take  $n = 0.012$  in manning's formula.  
(CO1) [Comprehension]
10. Sampling is used every day at water and wastewater treatment plants to determine the characteristics of the water. Sampling may be used to test the finished water for regulatory purposes - to ensure that the treatment plant is treating the water in compliance with regulations. Discuss the various sampling techniques to collect water and wastewater.  
(CO1) [Comprehension]
11. Attached growth process is a biological treatment process in which micro-organisms, responsible for the conversion of organic matters in waste water to gases and new cells are attached to some inert medium such as rocks or some specially designed plastic materials. Depict one biological treatment which treats wastewater by attached growth process.  
(CO2) [Comprehension]

## PART C

### ANSWER THE FOLLOWING QUESTION

(1 X 20 = 20M)

12. A town having a population of 30000 persons is producing the following sewages  
a) Domestic sewage at 120 lpcd having 200 mg/l of BOD  
b) Industrial sewage at 300000 lpd having 800 mg/l of BOD  
Design high rate single stage trickling filters for treating above sewage.  
Assuming that the primary sedimentation removes 35% of BOD. Allow an organic loading of 10000 kg/ha-m/day (excluding recirculation sewage). The recirculation ratio is 1.0 and surface loading should not exceed 170 ML/ha/day (including recirculation sewage).  
(CO2) [Application]