CBCS SCHEME

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18CV55

Fifth Semester B.E. Degree Examination, July/August 2021
Municipal Waste Water Engineering

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions.***

1 a. Explain the need for sanitation along with different types of Sewerage systems. **(10 Marks)**

b. Explain the factors affecting dry weather flow and the effects of flow variations in the design of sewerage system. **(10 Marks)**

2 a. Explain the different methods of domestic waste water disposal along with advantages and disadvantages. **(10 Marks)**

b. A city has a projected population of 50,000 residing over an area of 40 hectares. Find the design discharge for the sewer line for the following data :

i) Rate of water supply = 200 ℓpcd
ii) Time of concentration = 50 minutes.
iii) Average impermeability coefficient for the entire area = 0.3.

The sewer line is to be designed for a flow equivalent to the wet weather flow plus twice the dry weather flow. Use U.S ministry of health formula. Assume that 75% of water supply reaches in sewer as waste water. **(10 Marks)**

3 a. Draw a neat flow diagram and explain the Municipal Waste water treatment unit operations and process. **(10 Marks)**

b. A 40cm diameter sewer is to flow at 0.4 depth on a grade ensuring a degree of self cleansing equivalent to that obtained at full depth at a velocity of 80cm/sec. Find

i) The required grade.
ii) Associated velocity.
iii) Rate of discharge at this depth.

Given : i) Manning's rugosity coefficient = 0.014
ii) Proportionate area = 0.252 iii) Proportionate HMD (r/R) = 0.684. **(10 Marks)**

4 a. What are the aims and objectives of Sampling technique involved in the waste water analysis? **(04 Marks)**

b. Define the terms :
i) Self Cleansing Velocity ii) Turbidity iii) BOD. **(06 Marks)**

c. BOD of sewage incubated for one day at 30 °C has been found to be 100mg/ℓ. What will be the 5 day 20 °C BOD? Assume K = 0.12 [Base 10] at 20 °C. **(10 Marks)**

5 a. Explain the importance of screens and types of screens in the Sewage treatment process. **(10 Marks)**

b. Write a note on Necessity of Sedimentation tanks. Explain the types along with a neat sketch of rectangular settling tank. **(10 Marks)**

6 a. Discuss in detail the process of Deoxygenation and Reoxygenation with respect to self purification of Natural water, with a neat sketch. **(10 Marks)**

b. The domestic sewage of a town is to be discharged into a stream after treatment. Determine the maximum permissible effluent BOD and the percentage purification required in the treatment plant given the following particulars :
Population of town = 50,000 ; D.W.F of sewage = 150 ℓpcd
BOD contribution per capita = 0.075 kg/day ;
Minimum flow of stream = $0.20m^3$/sec ; BOD of stream = 3mg/ℓ ;
Maximum BOD of stream on downstream = 5mg/ℓ. **(10 Marks)**

7 a. Explain the working of a conventional Activated Sludge Process (ASP) with flow diagram. **(10 Marks)**

b. Design a primary settling tank of rectangular shape for a town having a population of 50,000 with a water supply of 180 ℓpcd. Assume detension period = 2 hrs , Length = 4 times the breadth , Depth = Between 2.4 to 3.6m , Average over flow rate = $30m^3/d/m^2$, Breadth = Not more than 7.5m. **(10 Marks)**

8 a. Explain the Constructional details of a Conventional trickling filter, with a neat sketch. **(10 Marks)**

b. Design a low rate filter to treat 6MLD of sewage of BOD 210 mg/ℓ. The final effluent should be 30mg/ℓ and organic loading rate is 320 $g/m^3/d$. **(10 Marks)**

9 a. Discuss in brief the Biological and Chemical methods of removal of Phosphorous from waste water. **(10 Marks)**

b. Draw a neat sketch of a septic tank with soak pit and write the design criteria required for septic tank. **(10 Marks)**

10 a. Write a note on two Pit latrines and Eco toilet. **(10 Marks)**

b. Define Advanced Wastewater Treatment (AWT). What are its objectives? How do you select the AWT process for removal of contaminants? **(10 Marks)**

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