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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 = $0.20 \text{ m}^3/\text{sec}$; BOD of stream = $3 \text{ mg}/\ell$;
Maximum BOD of stream on downstream = $5 \text{ mg}/\ell$. (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 detention period = 2 hrs , Length = 4 times the breadth , Depth = Between 2.4 to 3.6m , Average over flow rate = $30 \text{ m}^3/\text{d}/\text{m}^2$, 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 $30 \text{ mg}/\ell$ and organic loading rate is $320 \text{ g}/\text{m}^3/\text{d}$. (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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