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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2023 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 20CV5PCWWT **Max Marks: 100**
Course: Waste Water Treatment **Date: 21.02.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Discuss the relative merits of the separate and combined systems of sewage, and identify the conditions favorable for the adoption of each one of them. **06**

b) Compare dry weather and wet weather flow. Discuss briefly various factors affecting the dry weather flow. **06**

c) Calculate the velocity of flow and discharge in a sewer of the circular section having a diameter 1.2 m laid at a gradient of 1 in 500. The sewer runs partially full at 0.6 depth. Use Manning's formula taking n = 0.012. **08**

UNIT - II

2 a) A stoneware sewer is to be laid 3 m below the ground surface. Explain with sketches the different operations involved in the laying process. **08**

b) Write a note on the various shapes of sewer sections. Under what circumstances do you prefer Egg shaped sewers. Indicate the advantages of circular sewer sections. **06**

c) During the designing of sewer lines for a layout, there is a situation where the invert level of the branch sewer is found to be more than 600 mm above the peak flow level of the main sewer. Being a design engineer which type of manhole you will be recommending to suit the required condition. With the help of a neat sketch explain the working of recommended manhole type. **06**

UNIT - III

3 a) For domestic sewage having 5 days BOD of 200 mg/L at 20^0C, Calculate the BOD at 1 and 5 days at 12^0C. Assume the value of K as 0.18 per day at 20^0C. **08**

b) State and describe four important steps that may be carried out to know the characteristics of sanitary sewage. **06**

c) Differentiate between BOD and COD. Highlight the significance of the BOD to COD ratio. **06**

OR

4 a) A city discharges 100 cumecs of sewage into a river, which is fully saturated with oxygen and flowing at the rate of 1500 cumecs during its lean days with a velocity of 0.1 m/sec. The 5 days BOD of sewage at the given temperature is 280 mg/L. Determine when and where the critical DO deficit will occur in the downstream portion of the river. Assume coefficient of purification of the stream (f) as 4, DO of river water as 9.2 mg/L and de-oxygenation coefficient (K_D) as 0.1. **08**

b) Enumerate the general methods adopted for sewage disposal. Discuss their merits and demerits along with the conditions favorable for their adoption. **06**

c) The domestic sewage of the 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 data: **06**

a) Population of the town = 50000
b) DWF of sewage = 150 litres per capita per day
c) BOD of Raw sewage = 500 mg/L
d) Minimum flow of stream = 0.20 m^3/s.
e) BOD of stream = 3 mg/L
f) Max. BOD of stream on downstream = 5 mg/L.

UNIT - IV

5 a) Differentiate between conventional and high-rate trickling filters. **06**

b) Design a primary settling tank of rectangular shape for a town having a population of 50000 with a water supply of 180 litres per capita per day. **06**

c) Determine the size of high rate trickling filter for the following data: **08**
Sewage flow = 5 MLD, Recirculation ratio = 1.5, BOD of raw sewage = 250 mg/L, BOD removal in Primary clarifier = 30 %, Final desired effluent BOD = 30 mg/L.

OR

6 a) List the different modified aeration processes. Explain any three of them in detail. **10**

b) The average operating data for a conventional activated sludge treatment plant is as follows: **10**
Wastewater flow = 50000 m^3/d, Volume of aeration tank = 16000 m^3, influent BOD = 250 mg/L, Effluent BOD = 30 mg/L, MLSS = 2500 mg/L, Effluent suspended solids = 40 mg/L, Waste sludge suspended solids = 12000 mg/L, Quantity of waste sludge = 250 m^3/d. Determine (i) Aeration period (ii) Food to Microorganism ratio (iii) Percentage efficiency of BOD removal (iv) Sludge age.

UNIT - V

7 a) Describe the significance of Tertiary treatment in sewage treatment. Summarize the sequence of different treatment stages for domestic sewage with the help of a schematic diagram. **08**

b) Briefly explain the reverse osmosis process with the help neat sketch. **06**

c) Distinguish between microfiltration and nanofiltration. **06**

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