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**Question Paper Code: 94104**

B.E. / B.Tech DEGREE EXAMINATION, DEC 2021

Fourth Semester

Civil Engineering

19UCE404 Wastewater Engineering

(Regulation 2019)

Duration: Three hours

Maximum: 100 Marks

PART A (10 x 2 = 20 marks)

Answer any ten of the Following Questions

1. The BOD of a sewage incubated for one day at 30°C has been found to be 120mg/L. Identify the 5-day BOD at 20°C. Assume BOD rate constant  $K = 0.21$  (base e) per day at 20°C and temperature correction coefficient CO2  
(App)
2. Differentiate between dry weather flow and wet weather flow. CO3 (Ana)
3. Compare coagulation and Flocculation. CO3 (Ana)
4. Why baffles are provided in the sedimentation tank in sewage treatment? CO3 (Ana)
5. What is the purpose of using velocity control device in a grit chamber? CO1 (R)
6. If a circular sedimentation tank of diameter 35m treats 20 million litres of sewage daily, Calculate the applicable surface loading rate? CO2  
(App)
7. Differentiate between unit operation and unit processes in waste water treatment. Give two examples for each. CO3 (Ana)
8. Examine when it becomes necessary to provide manhole in sewerage system. CO3 (Ana)
9. Outline the types of trickling filters? CO1 (R)
10. Define sludge volume index CO1 (R)
11. List the methods of disposing the sewage effluent. CO1 (U)
12. State the purpose of using aerators in activated sludge process. CO2(App)
13. Define dilution factor CO1 (R)
14. Illustrate the factors affecting self purification of polluted streams. CO1 (R)

15. What is meant by oxygen sag curve? CO1 (U)

PART – B (5 x 16 = 80 marks)

1. (a) A metropolitan authority has sanctioned a new small colony of 150 persons essentially for middle income groups. Assured water supply from the municipal head works at a rate of 120 liters per person per day. Design a septic tank to treat the domestic sewage of this settlement. CO4 C (16)

Or

(b) Explain in detail about sewer appurtenances with neat sketches. CO1 U (16)

2. (a) Assume operation data for a conventional activated sludge process system for treating 70MLD flow are as follows: CO2 App (16)

Volume of the aeration tank (V) = 22000 m<sup>3</sup>

Influent BOD of wastewater (Y<sub>0</sub>) = 250 mg/L

Effluent BOD (Y<sub>E</sub>) = 20 mg/L

MLSS (X<sub>t</sub>) = 3000 mg/L

Effluent SS (X<sub>E</sub>) = 40 mg/L

Waste Sludge SS (X<sub>R</sub>) = 10000 mg/L

Quantity of waste sludge (Q<sub>w</sub>) = 350 mg/L

Or

(b) A metropolitan authority has sanctioned a new small colony of 150 persons essentially for middle income groups. Assured water supply from the municipal head works at a rate of 120 liters per person per day. Design a septic tank to treat the domestic sewage of this settlement. CO4 C (16)

3. (a) Assume you are working as environmental engineer in industry. You are proceeding with biological treatment unit, for the space problem you have not adopted with activated sludge process. Based on the waste water characteristics you should be design aeration tank also. Choose suitable biological treatment unit for this purpose and justify the reason. CO2 Ana (16)

Or

(b) With the aid of the schematic sketch, give a flow diagram of wastewater treatment plant consisting of secondary treatment by trickling filter, sludge digestion and disposal. Can you assess the performance of the filter? If so, how? CO3 Ana (16)

4. (a) Design a sewer to carry 17.5 lps of ultimate peak sewage flow at half full depth. Find also the slope of the sewer. Assume n = 0.013 CO 4 C (16)

Or

(b) Assume operation data for a conventional activated sludge process CO2 App (16)  
system for treating 70MLD flow are as follows:

Volume of the aeration tank (V) = 22000 m<sup>3</sup>

Influent BOD of wastewater (Y<sub>o</sub>) = 250 mg/L

Effluent BOD (Y<sub>E</sub>) = 20 mg/L

MLSS (X<sub>t</sub>) = 3000 mg/L

Effluent SS (X<sub>E</sub>) = 40 mg/L

Waste Sludge SS (X<sub>R</sub>) = 10000 mg/L

Quantity of waste sludge (Q<sub>w</sub>) = 350 mg/L

5. (a) Compare the characteristics of conventional rate filter and high rate CO3 Ana (16)  
filter.

Or

(b) What is sludge? What is sludge volume index? How is it useful in CO3 Ana (16)  
treatment and disposal of sludge for domestic waste from an Indian city?