



GIET UNIVERSITY, GUNUPUR – 765022

Ph.D. (Second Semester) Examinations, November – 2023

WPPECHE2011 – Waste Water Engineering (Chemical)

Time: 3 hrs

Maximum: 70 Marks

The figures in the right hand margin indicate marks.

Answer ANY FIVE Questions

(14 x 5 = 70 Marks)

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| 1.a. Define the following terms: (1) prechlorination (2) post chlorination (3) super chlorination (4) double chlorination (5) de chlorination | 14 |
| 2.a. Explain daily variation of sewage flow. How will you estimate the wastewater discharge for design of a wastewater treatment plant. | 14 |
| 3.a. The metabolism of the micro-organisms, in particular of the bacteria, is relevant for the self-cleaning of the body of water. Explain how and why, below a discharge of wastewater into a body of water the number of bacteria and protozoa changes as well as the oxygen content | 14 |
| 4.a. An activated sludge plant of $V = 1,350 \text{ m}^3$ has the following operating data: Inflow: $Q = 75 \text{ litres/s}$ BOD5 influent: $(\text{BOD}_5) = 200 \text{ mg/litre}$ Mixed liquor suspended solids in the aeration tank: $\text{MLSSAT} = 3.3 \text{ g/litre}$ Specific excess sludge production: $\text{ESA} = 0.8 \text{ kg DS/kg BOD}_5$ Recirculation ratio: $\text{RR} = 1.1$

Determine: (a) The sludge loading. (b) The daily quantity of excess sludge QES (m^3/d) produced daily. (c) How many inhabitants (I) per m^3 tank volume are treated if the specific influent load to the activated sludge plant is $40 \text{ g BOD}_5/(\text{I} \times \text{d})$? | 14 |
| 5.a. Nitrogen removal takes place in wastewater treatment plants through the biological-chemical processes of nitrification and denitrification. Describe both processes briefly. | 14 |
| 6.a. A wastewater treatment plant has a capacity of 5,000 PT with a wet sludge yield of 0.5 m^3 per PT and year ($\rho = 1.05 \text{ kg/dm}^3$). The dry solid matter content is 4 %. Calculate the minimum surface area requirement in ha for an agricultural utilisation if, according to the Sewage Sludge Ordinance, a maximum of 5 t within 3 years may be applied. | 14 |
| 7 a. In the biological wastewater treatment there are two basic processes: the activated sludge and the fixed-bed processes. Explain the differences with regard to the important characteristics of the bacteria | 14 |
| 8 a. In order to guarantee a secure operation of an activated sludge plant, various characteristic values are to be determined regularly. Name the essential characteristic values and give their respective process engineering information | 14 |

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