

Register No.: ..... Name: .....

## SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**FIFTH SEMESTER B.TECH DEGREE EXAMINATION (R), DECEMBER 2023**

**CHEMICAL ENGINEERING**

**(2020 SCHEME)**

**Course Code : 20CHT393**

**Course Name: Physico-Chemical Methods in Environmental Engineering**

**Max. Marks : 100**

**Duration: 3 Hours**

### **PART A**

***(Answer all questions. Each question carries 3 marks)***

1. Mention the significance of physico-chemical treatment methods.
2. List out the types of water filtration systems.
3. Explain the significance of treating wastewater.
4. Differentiate primary and secondary wastewater treatment techniques.
5. Describe the purpose of dissolved air floatation wastewater treatment.
6. Explain the significance of water softening in industries.
7. List out the factors affecting adsorption kinetics.
8. Distinguish disinfection from sterilization.
9. Compare reverse osmosis and electrodialysis.
10. How synthetic membrane differs from biological membranes?

### **PART B**

***(Answer one full question from each module, each question carries 14 marks)***

#### **MODULE I**

11. a) Elucidate the working principle of sedimentation unit and list out the factors influencing sedimentation. (7)  
b) List out any three coagulants and explain their coagulation mechanism (7)

#### **OR**

12. a) Explain the hydraulics of flow through granular media filter with a neat sketch. (7)  
b) Illustrate and discuss the challenges in linear phase filter design. (7)

#### **MODULE II**

13. Describe about physical, chemical and biological characteristics of wastewater with their sources. (14)

#### **OR**

14. Enumerate the principle, design parameters and design equation of an activated sludge unit with neat sketch. (14)

**MODULE III**

15. Design an aerated grit chamber for the treatment of sewage (14)  
wastewater. The average flow rate is  $0.2 \text{ m}^3 / \text{s}$  and the peaking factor  
is 2.55. Determine peak flowrate, grit chamber volume, width to depth  
ratio (1.2:1), detention time, total air supply requirement, volume of  
grit. Assume that the depth, and flowrate are 4 m and  $0.35 \text{ m}^3/\text{min}$   
respectively.

**OR**

16. a) Explain the working of aerosol separation unit using a neat (8)  
sketch.  
b) Classify the types of equalization process and discuss about (6)  
volume of equalization basins.

**MODULE IV**

17. (i) List out the various disinfection techniques and its significance. (4) (14)  
(ii) How does chlorine inactivate microorganisms? (4)  
(iii) Mention the significance of residual chlorine and breakpoint  
chlorination. (4)  
(iv) Whether chlorination an efficient way of eliminating pathogens?  
Justify. (2)

**OR**

18. Explain any three adsorption isotherms with their significance. (14)

**MODULE V**

19. What is dialysis? Explain the working of electro dialysis and (14)  
hemodialysis with neat sketch.

**OR**

20. a) Describe reverse osmosis, ultra-filtration and conventional (9)  
filtration techniques.  
b) Draw and explain the mechanism of demineralization. (5)

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