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

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SIXTH SEMESTER B.TECH DEGREE EXAMINATION (R), MAY 2023
CIVIL ENGINEERING
(2020 SCHEME)

Course Code : 20CET304

Course Name: Environmental Engineering

Max. Marks : 100 **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Why population forecasting is necessary in the design of public water supply schemes?
2. Define the term Per Capita Demand. How is it estimated?
3. List the various process for treatment of water and draw the schematic layout of typical water treatment plant.
4. Differentiate between coagulation and flocculation. Discuss the factors affecting coagulation.
5. Explain the theory of filtration.
6. Define breakpoint chlorination.
7. Discuss the significance of flow equalization with its advantages and disadvantages.
8. Define Sludge Volume Index. What is its importance in sewage treatment?
9. Sketch a typical UASB System and label its components.
10. Discuss the mechanism and working of an oxidation pond.

PART B

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

MODULE I

11. a) A water supply system is to be designed for a town for a design period of 30 years from 2020. The average municipal demand is predicted to be 200 lpcd throughout the design period. The population record for the town is as given below: (9)

Year	1971	1981	1991	2001	2011
Population	69000	87000	108000	137000	169000

Calculate the forecasted population at the end of the design period using the arithmetic increase method.

b) Explain fire demand. Discuss the various methods for the estimation of fire demand. (5)

OR

12. a) Define Intakes. Discuss the factors to be considered for the location of intakes. (5)

b) Density of population for town is 300 person/hectare and the rate of water supply is 250 litres per capita per day. Calculate the quantity of sanitary sewage for separate system and partially separate system. Given the total area to be served is 200 hectares and intensity of rainfall is 40 mm/hr. Make suitable assumption wherever necessary. (9)

Type of Area	% Area	Runoff Coefficient
Roof	20	0.9
Pavement Yard	15	0.8
Lawns/Gardens	30	0.15
Macadam Roads	20	0.4
Vacant Plots	15	0.10

MODULE II

13. a) Explain aeration method in water treatment with its significance and discuss the various methods of aeration. (8)

b) Describe the theory and principle behind sedimentation and explain the various types of settling. (6)

OR

14. a) Explain the mechanism behind coagulation and discuss in detail the various popular coagulants used. (10)

b) Discuss the basic concept of unit operations and unit processes in water treatment. (4)

MODULE III

15. a) Explain the various operational troubles in rapid sand filters and discuss the remedial measures. (6)

b) Explain in detail the various types of chlorination. (8)

OR

16. a) A water supply scheme is designed to meet the demand for a population of 20000 at per capita demand of 150 litres per day. Disinfection was done using bleaching powder which contains 30 percent of available chlorine. Estimate the (4)

quantity of bleaching powder required annually, if 0.3 mg/l of chlorine dose is required for disinfection.

b) Explain the various layouts of distribution networks with its advantages and disadvantages. (10)

MODULE IV

17. a) Design a rectangular sedimentation tank for treating the sewage from a city, with a maximum daily demand of 12 million litres per day. (6)

b) Explain the working of a trickling filter and discuss the ponding nuisance in a trickling filter with its remedial measures. (8)

OR

18. Design a conventional activated sludge plant to treat sewage from a population of 35000 with average sewage flow of 180 lpcd. The BOD of the sewage is 220 mg/l with 30% of BOD removed in the primary treatment and overall BOD reduction desired is 85%. Assume F/M (0.3 -0.4) and MLSS (1500-3000). (14)

MODULE V

19. a) Discuss the various natural waste water treatment systems. (6)

b) Explain sludge digestion and describe the various stages involved in sludge digestion. (8)

OR

20. a) Explain gravitational thickening of sludge. (4)

b) Design a septic tank for the following data:
Population= 200
Sewage flow rate = 150 lpcd
De-sludging Period= 1.5 year
Length: Width= 4:1
What would be the size of its soak well if the effluent from this septic tank has to be discharged in it. Assume percolation rate through the soak well to be 1400 l/m^3/day. (10)

****