

B.E. CIVIL ENGINEERING THIRD YEAR FIRST SEMESTER – 2025**SUBJECT: ENVIRONMENTAL ENGINEERING-I (CE/PE/B/T/311)****Time: 3 hours****Full Marks: 100****(50 Marks for each Part)****Instructions: Use Separate Answer scripts for each Part.*****Assume any necessary data within the usual range.*****Part - I (50 Marks)**

Sl.No.	Questions	CO	Marks
1. A	A water with low alkalinity of 10 mg/L as CaCO_3 will be treated with the alum lime coagulation (alum as coagulant and lime as coagulant aids). Alum dosage is 52.2 mg/L. Determine the lime dosage needed to react with alum.	[CO3]	[7]
1. B	Find area and dimension of a settling tank, where spherical discrete particle of dia 0.012 mm, and specific gravity of 2.65 removed 80% from a flow of 8 ML/D and dynamic viscosity at 20°C is 1.009 centipoise. Density at 20°C is 0.9952 gm/cc.	[CO3]	[8]
2. A	Design a spray aerator given the following data: Design flow: 220 m ³ /hr, Iron present in water 1 mg/L, Manganese present in water = 0.8 mg/L, Saturation concentration in O_2 = 7.92 mg/L, Aeration constant (base 10) = 70 cm/hr. Wind velocity 8 KMPH.	[CO3]	[15]
2. B	Find the time of exposure of water in gravity aerators falling through a distance of 4 m in a) single descent b) in 4 descent	[CO3]	[5]
3. A	Write short note on: JAR test.	[CO2]	[5]
3. B	a) i) Explain: "pre-chlorination has become much less common practice now-a-days". ii) Why re-chlorination is needed? OR, b) Draw a schematic diagram illustrating the treatment process for converting surface water sources into potable drinking water.	[CO2]	[3+2] or [5]
3. C	Describe the difference between orthokinetic and perikinetic flocculation.	[CO2]	[5]

[Turn over

Environmental Engineering I

Time: 3 hours

Full Marks 100
(50 marks for this part)**Part-II**

Answer all questions

*Hazen-William's nomogram is allowed**(Assume any data, if required, reasonably)*

1. Answer the following questions

- I. Discuss about the Fluoride and Arsenic pollution in Indian ground water along with their health effects and drinking water standards. 5 (CO1)
- II. Discuss about the factors affecting municipal water demand. 5 (CO1)
- III. Show and discuss about the different components of the population growth curve. 5 (CO1)
- IV. What are the advantages of radial system compared to the other distribution systems of water supply? 5 (CO4)

2.

- (a) Population of a city is 1.5 lakh, average water consumption rate is 270 lpcd, find out the (i) average daily demand; (ii) maximum daily demand; (iii) maximum hourly demand; (iv) fire demand considering fire flow $Q = [4637 \sqrt{P} \times (1 - 0.01\sqrt{P})]$ l/min where P is the population in thousand; and (v) coincident draft. 5 (CO1)

- (b) Discuss about the significance of Logistic Curve method of population projection based on the normal growth curve pattern.

Following are the populations of a city noted from the census department. Solve the problem by Logistic Curve method.

Year	1981	2001	2021
Population	31,200	1,73,000	3,05,000

Determine i) the saturation population, ii) the equation of the logistic curve, and iii) the expected population at 2041. (Deduction of formula is not required).

3+7 (CO1)

3.

Compute the total head-loss and an equivalent pipe of 300Ø between 'A' and 'F' of a system of pipe network as given below, which carries a total flow of 90 l/s. Consider Hazen William constant C_H for all pipes is 100.

Pipe segment	Length (m)	Diameter (mm)
AB	830	350
BC	720	300
CD	410	250
BE	485	250
ED	480	280
DF	540	400

OR

Find out the capacity of a storage reservoir required for balancing the variable demand for the following situation, breakdown storage and fire storage.

Given data -

Pumping hours: 12 h., from 5 AM to 11 AM, and again 1 PM to 7 PM.

Design population: 2,00,000; Rate of water supply: 190 lpcd.

Hourly demands are as follows:

Periods of day in h	% of Average hourly flow	Periods of day in h	% of Average hourly flow
11 PM – 5 AM	30	12 Noon – 1 PM	150
5 AM – 7 AM	50	1 PM – 2 PM	160
7 AM – 8 AM	90	2 PM – 5 PM	80
8 AM – 11 AM	250	5 PM – 6 PM	200
11 AM – 12 Noon	90	6 PM – 8 PM	100
		8 PM – 11 PM	80