Ref. No.: Ex/CE/PC/B/T/311/2024(S)

B.E. CIVIL ENGINEERING THIRD YEAR FIRST SEMESTER SUPPLEMENTARYEXAM - 2024

SUBJECT: ENVIRONMENTAL ENGINEERING-I (CE/PE/B/T/311)

Time: 3 hours **Full Marks: 50**

Instructions: Use Separate Answer scripts for each part.

Part - I

Sl. No.	Question	CO	Marks
1. A	Find the terminal velocity at 20°C of spherical particle of 2 mm diameter, 2.65 specific gravity. Flow is 10 MLD and kinematic viscosity at 20°C is 1 centistoke.	[CO3]	[10]
1. B	The analysis of a hard water shows the following compositions: Free carbon-di-oxide:4 mg/l; Alkalinity: 65 mg/l; Non-carbonate hardness: 92 mg/l; Total magnesium: 15 mg/l; Assume that it is possible to remove all but 35 mg/l of carbonate hardness with lime and that the treated water is to have a total hardness of 80 mg/l. Determine the amount of hydrated lime and soda required for treatment per million litre of raw water.	[CO3]	[6]
1. C	Find area and dimension of a settling tank, where spherical discreet particle of dia 0.015 mm, and specific gravity of 2.65 removed 70% from a flow of 12MLD and dynamic viscosity at 20°C is 1 centipoise. Density at 20°C is 0.99 gm/cc.	[CO3]	[7]
1. D	Find the time of exposure of water in gravity aerators falling through a distance of 4m in a) single descent b) in 9 descent and c) in 16 descent	[CO3]	[4]
1. E	In a spray aeration process using nozzles, water is to be exposed for 2 seconds. Estimate the driving force required for a) vertical jet, b) jet inclined at 60° to the horizontal. Take velocity coefficient for nozzle as 0.95. Also find out the associate carry and rise in each case.	[CO3]	[8]
1. F	Determine the % of HOCl in an aquous solution, $[OCl^-]$ and $[HOCl]$ at a temperature 20°C, $pH = 9$, $K_{OCl} = 2.5 \times 10^{-8}$	[CO3]	[3]
1. G	A water with low alkalinity of 20 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]	[5]
2. A	i) Explain: Super-chlorination. ii) Explain why chlorination need to be carried out till the breakpoint chlorination.	[CO2]	[2+2]
2. B	Describe the difference between orthokinetic and perikinetic flocculation.	[CO2]	[3]

[Turn over

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B.E. CIVIL ENGG. 3rd YEAR 1ST SEM. SUPPLEMENTARY EXAMINATION 2024

ENVIRONMENTAL ENGINEERING I

Time: Three hours

Full Marks 100
(50 marks for this part)

Use a separate Answer-Script for each part

Part-II

Answer all Questions

Hazen-William's nomogram is allowed

(Assume any data, if required, reasonably)

Q.1. Write short notes on the following (any four): (4×5) = 20 (CO1, CO4)

I. Discuss about the 'Distribution of Earth's fresh water'.

II. Mention the unit of measurement, acceptable limit, permissible limit and effect / disease of the following parameters of drinking water as per IS 10500: 2015 standard: i) Arsenic; and ii) Nitrate

III. Describe the factors affecting the total water demand.

IV. Describe the functions of a distribution/service storage water reservoir.

V. What are the advantages and disadvantages of 'ring main system' of water distribution networks?

Q.2. (CO1)

Deduce the equation for 'arithmetic increase method' of population projection.

The populations of a town as per the Census record are given below for the years 1971 to 2021. Assuming that the scheme of water supply will commence to function from 2025, it is required to estimate the population of 30 years and also the intermediate population of 15 years after 2025.

Year	1971	1981	1991	2001	2011	2021
Population	41,500	59,200	75,700	99,400	124,600	157,300

Project the population by 'arithmetic increase method'.

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Q.3. (CO4)

For the water supply of a small rural town with the daily requirement of 2,50,000 liters, storage capacity of a proposed distribution reservoir is to be estimated.

The pattern of draw off is as under:

7.00 A.M. – 8.00 A.M. 30% of day's supply
8.00 A.M. – 5.00 P.M. 35% of day's supply
5.00 P.M. – 6.30 P.M. 30% of day's supply
6.30 P.M. – 7.00 A.M. 5% of day's supply

The pumping to the reservoir is to be done at a constant rate of 8 hours per day from 8 A.M. to 4 P.M.

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OR

A system of pipe network as shown below carries a total flow of 1.5 m^3/min from A to C. Compute the total head-loss between A and C using equivalent pipe method. Consider Hazen-William's constant 'C' for all pipes as 100.

Pipe segment	Length (m)	Diameter (mm)
AB	680	300
BC	410	250
AD	475	250
DC	480	280

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