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CE 181503

Roll No. of candidate

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24/2/22 2021

BINA CHOWDHURY CENTRAL LIBRARY
(I-MIT & NIPS)
Ashok Hariharanapara,
Coimbatore - 79.017

B.Tech 5th Semester End-Term Examination

CE

ENVIRONMENTAL ENGINEERING – I

(New Regulation & New Syllabus)

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer Question No. 1 and any *four* questions.

1. (a) Choose the correct answer. (5 × 1 = 5)
- (i) Quality parameters of rain water from different sources are given below:

Sources	Quality parameters				
	Ph	Turbidity (NTU)	TDS (mg/l)	Chlorides (mg/l)	Fluorides (mg/l)
1	9.5	1	500	100	15
2	6.0	2	1000	200	1.5
3	8.0	5	1400	250	1.0
4	7.0	10	1600	300	0.1

Water drawn from which of the above sources can be tolerated for drinking without any treatment:

- (a) 1 and 2 (b) 2 and 3
(c) 3 only (d) 4 only
- (ii) Hardness limit of water for public supplies ranges between
- (a) 50 to 75 ppm (b) 75 to 115 ppm
(c) 115 to 200 ppm (d) 200 to 300 ppm
- (iii) An ideal setting basin has a plan area of 100 m². If a flow of 2400 m³/day has passed through the basin, them for removing the discrete particle completely from the basin, the terminal setting velocity is, nearly
- (a) 1 m/hour (b) 0.5 m/hour
(c) 0.1 m/hour (d) 0.05 m/day

[Turn over

(iv) Consider the following characteristics:

1. Effective size: 0.5 mm
2. Uniformly coefficient: 2.5
3. Filtration rate: 5.0 m³/m²/h

Which of the above values are correct in respect of rapid sand filter?

- (a) 1 and 2 (b) 2 and 3
(c) 1 and 3 (d) 1, 2 and 3

(v) Which of the following treatments reduce salinity of water

1. Flocculation and Sedimentation
2. Filtration
3. Reverse osmosis
4. Electrodialysis

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WATER TREATMENT

Select the correct answer using the codes given below:

- (a) 1 and 2 (b) 3 and 4
(c) 2 and 3 (d) 1 and 4

(b) Fill in the blank: (5 × 1 = 5)

- (i) The maximum permissible colour for domestic supplies based on cobalt scale is _____ ppm.
- (ii) Odour is measured in terms of _____ Odour number.
- (iii) A mechanical process of mixing water with air intimately is called _____.
- (iv) M.P.N is related with bacterial _____.
- (v) The chlorine added beyond the break point for the safety of public against some disease is known as _____.

2. (a) Answer the following: (4 × 2 = 8)

- (i) Name common dissolved impurities in water.
- (ii) The concentration of OH⁻ ion in a water sample is measured as 17 mg/L at 25^o C. What is the pH of the water sample?
- (iii) Name four water borne diseases through bacterial infections.
- (iv) Explain – Basic theories of Geometrical Increase Method of Population forecasting.

- (b) Estimate the domestic water requirement of a town in a year AD 2020 by projecting the population of the town by incremental method from the following population data: (7)

Year	Population	Year	Population
1960	2,37,98,624	1990	6,34,67,823
1970	4,69,78,325	2000	6,90,77,421
1980	5,47,86,437		

Take, per capita demand 200 L/Capita/Day

3. (a) Derive an expression for settling velocity of a discrete particle in water. (5)
- (b) Design a rectangular sedimentation tank to remove spherical particles of size equal to and greater than $50 \mu\text{m}$ with a specific gravity of 2.3 from 100 Million Litres per day of turbid water. Also determine the detention time of the tank. (10)

Assume:

- (i) Stoke's Law of sedimentation is applicable
- (ii) length to width ratio of the tank = 3:1
- (iii) depth of tank is 3 m.
- (iv) kinetic viscosity of water = $1.01 \times 10^{-6} \text{ m}^2/\text{s}$
4. (a) Derive an expression for determining discharge of a well sunk in a confined aquifer. (6)
- (b) During a recuperation test, the water in an open well was depressed by pumping, by 2.5 meters and it recuperated 1.8 meters in 80 minutes. Determine (5)
- (i) yield from a well of 4 m diameter under a depression head of 3 meters
- (ii) the diameter of the well to yield 8 litres/second under a depression head of 2 metres.
- (c) Distinguish between Type I and Type II settling of suspended particles. (4)
5. (a) A coagulation-sedimentation plant clarifies 50 MLD of water. The raw water has an alkalinity equivalent of 4 mg/l of CaCO_3 . The filter alum required at the plant is 20 mg/l. Determine the filter alum and the quick lime (containing 88% to CaO) required per year by the plant. Use the following molecular weights: (Al=27, S=32, O=16, H=1, Ca=40, C=12) (5)
- (b) Explain with sketches different layout of water distribution networks mentioning advantages and disadvantages. (10)

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6. (a) Determine the maximum displacement velocity, without the fear of settled particles to be lifted up and the ratio of length to depth of the settling unit for the following particles: (8)
- (i) alum floc having $S_s = 1.1$ and diameter = 0.1 cm, and
 - (ii) anthracite coal dust having $S_s = 1.5$ and diameter = 0.01 cm.
- Assume a Weisbach-Darch friction factor $f = 0.025$ and temperature of 20°C .
- (b) Design a rapid sand filter system for a water supply of 9MLD to a township. Assume rate of infiltration to be 4000 litres/hr/sq.m. Assume any other data not supplied. (7)

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7. Write short notes on the following: (any three) (3×5=15)
- (a) Difference between rapid sand filter and slow sand filter
 - (b) Chlorination process in water treatment and effect of pH on chlorination.
 - (c) Pressure filter.
 - (d) Difference between discrete particle settling and flocculent settling