

B.Tech 6th Semester Exam., 2014

ENVIRONMENTAL ENGINEERING—I

Time : 3 hours

Full Marks : 70

Instructions :

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

1. Choose the correct option (any seven) : $2 \times 7 = 14$

(a) According to IS 10500 : 1991, permissible limit for dissolved solids in drinking water in absence of alternative source is

- (i) 500 mg/L
- (ii) 1000 mg/L
- (iii) 2000 mg/L
- (iv) None of the above

(b) Which one of the following pollutants does not leave any residue?

- (i) Pesticide
- (ii) Mercury
- (iii) Noise
- (iv) Heavy metal

(c) For a given discharge, efficiency of sedimentation tank can be increased by

- (i) increasing depth of tank
- (ii) decreasing depth of tank
- (iii) increasing surface area of tank
- (iv) decreasing surface area of tank

(d) The maximum hourly consumption is generally takes as

- (i) 2.7 times of annual average hourly demand
- (ii) 2.7 times of average daily demand
- (iii) 2.7 times of maximum daily demand
- (iv) 1.5 times of annual average hourly demand

(e) Groundwater is generally free from

- (i) dissolved solids
- (ii) salts
- (iii) suspended solids
- (iv) heavy metals

(f) As per IS 1172-1972, the average domestic water consumption in an Indian city is

- (i) 40 LPCD
- (ii) 70 LPCD
- (iii) 135 LPCD
- (iv) 270 LPCD

2. (a) What do you understand by design period of a water-supply scheme? Describe in brief the factors considered in estimating design period of a water-supply scheme.

(b) In two periods, each of 20 years, a city has grown from 30,000 to 1,70,000 and then to 3,00,000.

Using the above data, determine the saturation population and the equation of the logistic curve for the prediction of future population.

7+7

3. (a) Describe, in brief, infiltration galleries and infiltration well with the help of neat sketches.

(b) Why are tube wells generally preferred as source of drinking water supply for a relatively larger population over open well?

8+6

4. (a) With the help of a neat sketch, differentiate between dry intake wet and intake tower.

(b) In a water treatment plant, the pH of incoming and outgoing waters are 7.2 and 8.4 respectively. Assume a linear variation of pH with time, determine the average pH value of water.

7+7

(g) Modern turbidity meters working on the principle of 'scattering of light' are known as

(i) Jackson's turbidity meter

(ii) turbidity rod or tape

(iii) nephelometric turbidity meter

(iv) None of the above

(h) Typhoid is caused by

(i) bacterial infection

(ii) viral infection

(iii) hormonal infection

(iv) None of the above

(i) In which water distribution system the minimal length of distribution pipe is required?

(i) Dead end

(ii) Grid iron

(iii) Ring system

(iv) Radial system

(i) Most suitable disinfection process for Indian condition is

(i) ozonation

(ii) radiation

(iii) chlorination

(iv) None of the above

(6)

- (b) From a water reservoir 3 m deep and maximum water level at 30 m, water is to be pumped through rising main to a distance 1500 m and an elevation 75 m at the constant rate of 900000 L/hour. Calculate the economical diameter of the rising main and the horsepower of the pump. [Neglect minor losses and use $f = 0.01$] 6+8

9. (a) Find the settling velocity of a discrete particle in water under conditions when Reynolds number is less than 0.5. The diameter and the specific gravity of the particle are 5×10^{-3} cm and 2.65 respectively. Water temperature is 20°C . [Kinematic viscosity of water at $20^\circ\text{C} = 1.01 \times 10^{-2} \text{ cm}^2/\text{s}$]
- (b) Define noise pollution. Enumerate the sources and effects of noise pollution. 7+7

(5)

5. A coagulation-sedimentation plant clarifies 40 million liters of water everyday. The quantity of filter alum required at the plant is 18 mg/L. If the raw water is having an alkalinity equivalent to 5 mg/L of CaCO_3 , determine the quantity of filter alum and the quicklime (with 85% purity) required per year by the plant. [Molecular weight : Al=27, S=32, O=16, H=1, Ca=40 and C=12] 14

6. (a) Differentiate between slow sand filter and rapid sand filter.
- (b) A filter unit is $4.5 \text{ m} \times 9 \text{ m}$. Daily the unit filters 10000 m^3 and spends 15 minutes time for backwashing. The rate of backwash water supply is $10 \text{ L/m}^2/\text{s}$. Compute the average filtration rate, quantity, and the percentage of treated water used in washing, and the rate of wash water flow in each trough. Assume 4 troughs. 6+8
7. Define hardness of water. Describe various methods employed for the removal of hardness from water. 14
8. (a) What are the requirements of a good distribution system?