

**B.Tech 6th Semester Exam., 2019****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 answer of the following  
(any seven) : 2×7=14

- (a) The distribution mains are designed for
- (i) maximum daily demand
  - (ii) maximum hourly demand
  - (iii) average daily demand
  - ~~(iv)~~ maximum hourly demand on maximum day

(b) As compared to geometrical increase method of forecasting population, arithmetic increase method gives

- ~~(i)~~ lesser value
- (ii) higher value
- (iii) same value
- (iv) accurate value

(c) Methemoglobinemia, the "blue baby" syndrome is caused by consuming water containing excess of

- (i) fluoride
- (ii) phosphate
- ~~(iii)~~ nitrate
- (iv) nitrite

(d) The temporary hardness in water is caused by the presence of

- ~~(i)~~ bicarbonates of Ca and Mg
- (ii) sulphates of Ca and Mg
- (iii) chlorides of Ca and Mg
- (iv) nitrates of Ca and Mg

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(e) A wastewater sample contains  $10^{-5.6}$  mmol/L of  $\text{OH}^-$  ions at  $25^\circ\text{C}$ . The pH of this sample is

(i) 8.6

~~(ii) 8.4~~

(iii) 5.6

(iv) 5.4

(f) Which of the following chemicals is employed for dechlorination of water?

~~(i) Sodium sulphite~~

(ii) Sodium bicarbonate

(iii) Calcium carbonate

(iv) Hydrogen peroxide

(g) Turbidity is measured on

~~(i) standard silica scale~~

(ii) standard cobalt scale

(iii) standard platinum scale

(iv) platinum cobalt scale

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(h) Zero hardness of water is achieved by

(i) using lime soda process

(ii) excess lime treatment

~~(iii) ion-exchange method~~

(iv) using excess alum dosage

(i) Why are the gate valves provided in distribution system?

(i) To minimize the flow pressure in the network

(ii) To maximize the usage of distribution system

~~(iii) To control the flow in the pipe network~~

(iv) To identify the loss through illegal connections

(j) Coal based thermal power stations pollute the atmosphere by adding

(i)  $\text{NO}_x$  and  $\text{SO}_2$

~~(ii)  $\text{NO}_x$ ,  $\text{SO}_2$  and SPM~~

~~(iii)  $\text{NO}_x$ ,  $\text{SO}_2$ , SPM and CO~~

(iv)  $\text{NO}_x$ , SPM and CO

2. (a) Discuss in detail, the various factors which affect the rate of demand. 7

(b) The population of 5 decades from 1930 to 1970 are given below :

Year	1930	1940	1950	1960	1970
Population	25000	28000	34000	42000	47000

Find out the population after one, two and three decades beyond the last known decade, by using arithmetic increase method. 7

3. (a) What are 'infiltration galleries' and 'infiltration wells'? Explain both with neat sketches. 7

(b) Water contains 210 g of  $\text{CO}_3^{2-}$ , 122 g of  $\text{HCO}_3^-$  and 68 g of  $\text{OH}^-$ . What is the total alkalinity of water expressed as  $\text{CaCO}_3$ ? 7

4. (a) What is turbidity? What are principles involved in the measurement of turbidity by Jackson's and Nephelo turbidity meter? 7

(b) In a water treatment plant, the pH values of incoming and outgoing waters are 7.2 and 8.4 respectively. Assuming a linear variation of pH with time, determine the average pH value of water. 7

5. (a) Describe in detail, the methods employed to purify water before supplying to the consumers. 7

(b) Compute the dimensions of a continuous flow rectangular settling tank treating average of  $24 \times 10^5$  litres/day. Take detention period for raw water sedimentation to be 6 hours. 7

6. (a) Describe with a neat sketch the working of a pressure filter. What are the relative advantages and disadvantages of this type over those of the gravity types? 7

(b) Mention any three methods of softening water. Describe zeolite process of softening water in detail. 7

7. (a) Illustrate with sketches the different types of layouts of pipe systems in distributing water and compare their comparative merits and demerits. 7
- (b) Mention the methods of disinfection. Describe chlorination in detail. 7
8. What is plume? Explain various plume behaviour in detail with the help of neat sketches. 14
9. Write short notes on any *four* of the following :  $3\frac{1}{2} \times 4 = 14$
- (a) Alkalinity
  - (b) Coagulation and flocculation
  - (c) Disinfection and sterilization
  - (d) Secondary air pollutants
  - (e) Aeration
  - (f) Fabric filter

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