18CV46

Fourth Semester B.E. Degree Examination, Dec.2024/Jan.2025
Water Supply and Treatment Engineering

Time: 3 hrs.   Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume any suitable missing data.

Module-1

1 a. Justify the need for protected water supply. **(05 Marks)**
   b. Explain Master Plan method or zoning method of forecasting population. **(05 Marks)**
   c. If the design population of a town is 1,50,000 having average water consumption rate of 150 LPCD, estimate the maximum daily demand, hourly demand, fix demand and coincident demand. **(10 Marks)**

OR

2 a. Write a note on design period and factors governing the design period. **(06 Marks)**
   b. Define per Capita demand. Also list the factors affecting the per capita demand. **(04 Marks)**
   c. The population of a certain town from 1970 to 2010 is as given below. Find out the population after two and three decades beyond the last known decade by :
   (i) Arithmetical increase method
   ii) Geometrical increase method and
   iii) Incremental Increase method :

Year	1970	1980	1990	2000	2010
Population	45000	48000	54000	62000	67000

   (10 Marks)

Module-2

3 a. Enumerate the difference between surface and sub surface sources. **(04 Marks)**
   b. Give the acceptable and permissible limits as per IS 10500 : 2012 drinking water quality standards for below :
   (i)   pH
   (ii) Total Hardness
   (iii) Chlorides
   (iv) Nitrates **(06 Marks)**
   c. With the aid of neat sketches, explain the following :
   (i)   River Intakes
   (ii) Canal Intakes **(10 Marks)**

OR

4 a. List the types of aerators. Explain any one type in detail. **(06 Marks)**
   b. Mention the factors governing the selection of a particular source of water. **(04 Marks)**
   c. Write down a flow chart of a typical water treatment plant and explain each unit with its specific role in the water treatment process. **(10 Marks)**

Module-3

5 a. Explain the jar test step by step procedure to determine optimum dosage of coagulants. **(05 Marks)**

   b. At a water treatment plant serving 50000 people at the water supply rate of 180 litres per capita per day, 50 tones per annum of Alum is used. Find
   - (i) Daily requirement of Alum
   - (ii) Alum dosage applied in mg/lt. **(05 Marks)**

   c. Design a rectangular sedimentation basin to treat 2.5 million litres of raw water per day. The detention period may be assumed to be 3 hrs. **(10 Marks)**

OR

6 a. Differentiate between rapid sand filters and slow sand filters. Also explain the operational troubles in rapid sand filters. **(10 Marks)**

   b. Design a set of 6 rapid sand filters for treating water at water works, which has to supply water to a town of population of 1,50,000 with the water supply rate of 200 lpcd. Also consider one unit out of 6 units will be kept as stand by unit. **(10 Marks)**

Module-4

7 a. Explain break point chlorination with the aid of neat graph. **(10 Marks)**

   b. Calculate the amount of Pure Lime and Soda (85% pure) required for the treatment of 40 m^3 of water, whose analysis is as follows :
   $Ca(HCO_3)_2$ = 48.0 PPM, $Mg(HCO_3)_2$ = 40.0 PPM
   $MgSO_4$ = 35.0 PPM, $CaSO_4$ = 37.5 PPM
   $MgCl_2$ = 25.0 PPM, NaCl = 10.0 PPM
   Fe_2O_3 = 40.0 PPM, SiO_2 = 30.0 PPM **(10 Marks)**

OR

8 a. Explain Zeolite process. Give its advantages and disadvantages. **(10 Marks)**

   b. Chlorine usage in the treatment of 25000 m^3/day is 9 kg/day. The residual chlorine after 10 min contact is 0.2 mg/lt. Calculate the dosage in milligrams per litre and the chlorine demand of water. **(06 Marks)**

   c. Explain the Nalagonda Technique of defluoridation process. **(04 Marks)**

Module-5

9 a. Give the comparison of Reciprocating Pumps with the centrifugal pumps. **(06 Marks)**

   b. Write a note on the Economical Diameter of the pumping mains. **(04 Marks)**

   c. List and explain the different methods of distribution of water. **(10 Marks)**

OR

10 a. With the aid of neat diagrams, explain the following :
   - (i) Air relief value
   - (ii) Fire hydrant. **(10 Marks)**

   b. Write down the factors affecting the selection of pipe materials. **(04 Marks)**

   c. Explain any two water distribution layouts with their advantages and disadvantages. **(06 Marks)**

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