CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐   **21CV43**

Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Public Health Engineering

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a.   Define Per Capita demand. Explain the factors affecting the same. **(08 Marks)**
    b.   What is Fire demand? Compute fire demand for a city having population 1,40,000 using various formulas. **(06 Marks)**
    c.   Write short notes on :
       i) Need for protected water supply   ii) Variation in water demand **(06 Marks)**

OR

2   a.   What is design period? Discuss the factors affecting the design period of water supply projects. **(06 Marks)**
    b.   The following data are available for a town. Estimate the probable population in the year 2033, 2043 by Geometric Increase and Incremental Increase method.

Year	1993	2003	2013	2023
Population	80000	120000	168000	228000

(10 Marks)
    c.   Give the maximum permissible limits as per BIS for the following parameters:
       i) Hardness   ii) Fluoride   iii) Turbidity   iv) Nitrates. **(04 Marks)**

Module-2

3   a.   With the help of flow diagram, explain the complete sequence of water treatment plant. **(08 Marks)**
    b.   Explain the types of settling in sedimentation tank. **(06 Marks)**
    c.   Determine the quantity of Alum required in order to treat 13 million litres of water per day at treatment plant where 12 PPM of alum dose is required. Also determine the amount of CO_2 gas which will be released/liter of water treated. Given molecular weight of Aluminium = 26, Sulphur = 32, Oxygen = 16, Hydrogen = 1, Carbon = 12. **(06 Marks)**

OR

4   a.   What is filtration? Explain the theory of filtration. **(06 Marks)**
    b.   With a neat sketch explain the working of Rapid Sand filter. **(07 Marks)**
    c.   Design six slow sand filter beds from the following data:
Population 50,000 ; Per capita 150 LPCD ; Rate of filtration 180 $L/H/m^2$, Length of each bed is equal to twice the breadth. Assume maximum demand as 1.8 times the average daily demand. Also assume 1 unit is kept stand by. **(07 Marks)**

Module-3

5   a.   What is disinfection? What are the requirements of good disinfectants? What are the factors affecting the disinfection process. **(06 Marks)**
    b.   What is Chlorination? Explain different types of chlorination. **(06 Marks)**
    c.   What is softening? Explain lime soda process of hardness removal. **(08 Marks)**

OR

6 a. Explain combined system and separate system of sewerage giving their merits and demerits.
(08 Marks)

   b. Define sampling. Explain Grab, Composite, Integrated sampling. (04 Marks)

   c. The BOD of a sewage incubated for 5 days at 30°C has been found to be 110 mg/L. Calculate the BOD_5 at 20°C assuming $K_{(20)} = 0.1$/day. (08 Marks)

Module-4

7 a. Write the flow diagram employed for a conventional wastewater treatment plant. Indicate the importance of each unit. (08 Marks)

   b. With a neat sketch explain the working of
   i) Screens   ii) Grit Chamber. (12 Marks)

OR

8 a. What is meant by Activated Sludge process? Describe with sketch the treatment of sewage by Activated Sludge process. (10 Marks)

   b. List and explain the modifications of Activated Sludge process. (10 Marks)

Module-5

9 a. Explain with neat sketch the working of Trickling filter. (08 Marks)

   b. Explain with sketch the working of the following :
   i) Bio – Towers
   ii) Rotating Biological Contactors (RBC) (12 Marks)

OR

10 a. Explain with sketch the working of the following :
   i) Sludge drying beds
   ii) Oxidation ditch (10 Marks)

   b. Explain briefly the different stages of sludge digestion process in a digester. (10 Marks)

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