

Department of Civil

Subject: ENVIRONMENTAL -I

Class: III B.Tech

Civil - II Sem(2018-2019)

UNIT: 1

- a) Define Design period and List water born diseases.
- b) List four factors affecting per capita water demand.
- c) What are the components of a water supply system?
- d) What is the objective of water supply system?
- e) Define the term potable water and wholesome water.
- f) Define "per capita demand".
- g) What do you understand by the term per capita demand? In a town or city for what purpose generally water required.
- h) The population figures of a town during the four decades i.e. 1960, 1970, 1980 and 1990 are 25,000, 30,500, 35,500 and 42,000 respectively. Predict its population in the year 2000 and Compare the results through Arithmetical progression, Geometrical progression, Incremental increase method and Decreasing Rate method.
- f) Explain the different methods of population forecasting.
- g) List out and explain the factors affecting the rate of demand of water in a city or town.
- h) Explain in detail any two methods used for the prediction or forecasting of population of a city.
- i) What is fire water demand? How the fire water demand of a city is estimated?
- j) The population of a city obtained from census records is as follows.

Year	1911	1921	1931	1941	1951	1961	1971	1981	1991
Population	20000	22000	25000	27500	34100	41500	47050	54500	61000

Estimate the population of the city in the year 2011 and 2021 by Geometrical increase method of population forecasting.

UNIT-2

- A) Which valve allows flow only in one direction?
- B) Define mass curve.
- C) What are the intake structures in water supply systems? With a neat sketch describe the intake structure of a river used to tap the water from river.
- D) Enumerate the types of pumps which may be employed in water supply schemes. Briefly discuss their advantages and disadvantages.
- E) What are the sources of water that can be considered for water supply to a town? Explain the factors that are to be considered in selecting a source of water in a water supply system.

- F) Classify the sources of water available for water supply. Explain the factors that influence the suitability of a water source for the water supply with respect to its quality and quantity.
- G) What are the intake structures in water supply systems? With a neat sketch describe the intake structure of a reservoir constructed used to tap the water.
- H) Classify the pumps which may be employed in water supply schemes. What are the factors affecting the selection of a pump used in water supply systems? Explain in brief.
- I) Design a circular pipe to convey the water from the water source to the water treatment plant intended to supply water to a city of 2 lakh population. The average per capita demand of the city is 150 liters/day. The Hazen-Williams' coefficient for the new cast iron pipe may be taken as 130.
- J) Determine the hydraulic gradient to be maintained in laying a 90cm diameter cast iron pipe carrying a discharge of $0.75 \text{ m}^3/\text{sec}$ using (i) Darcy-Weisbach's formula and (ii) Hazen-William formula. The Darcy-Weisbach's friction coefficient is 0.015 and the Hazen-William's coefficient is 130.

UNIT-3

- A) What is the hydrogen ion concentration if the pH of water is 9?
- B) As per the drinking water standards in India, What are the permissible limits of Iron (as Fe) concentration and Hardness allowed to be present in water for drinking.
- C) As per the drinking water standards in India, What are the desirable and permissible limits of fluoride concentration allowed to be present in water for drinking?
- D) What is the optimum dose of a Coagulant? How the optimum coagulant dose is determined by conducting the Jar test in the laboratory.
- E) What is temporary hardness and permanent hardness? Describe the defluoridation methods for the removal of fluorides from water.
- F) Name the physical characteristics of water with reference to its quality.
- G) Explain characteristics of water.

UNIT-4

- A) Name any one natural coagulant and two chemical coagulants used in water treatment.
- B) What is flocculation and Coagulation?
- C) Write the Stoke's equation for terminal velocity of a spherical particle in sedimentation.
- D) List the operational troubles encountered in rapid sand filter's operation and maintenance.
- E) What is Coagulation? Derive Stoke's equation for estimating the settling velocity of a spherical discrete particle in sedimentation.
- F) Design a rapid sand filter for the treatment of water required for a population of 60,000 in a town. The rate of water supply is 180 liters per person per day. The filters are rated to work at 3000 liters per hour per m^2 . Assume any other data if necessary suitably. (Need not design the under water drainage system)
- G) What is filtration? Explain the theory of filtration in the purification of water.
- H) Design a rapid sand filter for the treatment of water required for a population of 75,000 in a town. The rate of water supply is 150 liters per person per day. The rate of filtration is 210 liters/hour/ m^2 . (Need not design the under water drainage system)
- I) Design a circular sedimentation tank for water works which supplies 1.4×10^6 liters/day to a town. The sedimentation (detention) period is 5 hours, the velocity of flow is 12 cm/minute, and depth of water in the tank is 4.0 m. Assume an allowance for sludge to be made is 80 cm.

UNIT-5

- A) Define residual chlorine and available chlorine.
- B) Define pre chlorination and super chlorination
- C) Name the methods of defluoridation generally used in water treatment
- D) What is the purpose of air valve and drain valve?

- E) Define mass curve. How is it useful in a water supply project?
- F) What is temporary hardness and permanent hardness? Describe the method of water softening by Zeolite Process (Base exchange process).
- G) Design a rectangular sedimentation tank for the treatment of water that is to be supplied to a city with a population of 25000. The average daily per capita water demand is 150 liters. Assume that the detention period is 5 hours.
- H) What is filtration in water treatment ? Compare the slow and rapid sand filters
- I) Define disinfection. List different methods of disinfection of water and explain the disinfection using chlorine
- J) List different methods of disinfection of water. Explain the disinfection with Ozone and chloramines
- K) Explain Water Softening methods.
- L) Name the methods of water softening used in water treatment

UNIT-6

- A) What are the requirements of a good water distribution system in a water supply project?
- B) Describe in brief the types of distribution systems.
- C) State the systems of plumbing. Explain each of the system along with its drawing.
- D) What are the methods of pipe network analysis? Write short notes on Hardy – Cross method of analysis.
- E) List out various appurtenances in water distribution systems. Explain the sluice valve and air relief valve along with neat sketches.
- F) What are the types of distribution systems? Describe various layouts of water distribution network
- G) State the systems of plumbing. Explain each of the system along with its drawing.
- H) What are the types of distribution reservoirs? How the capacity of the balancing tank is estimated?
- I) List out various appurtenances in water distribution systems. i) Explain the principles governing the design of building drainage.