Reg. No. :

Question Paper Code : X10467

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
AND APRIL/MAY 2021
Fourth/Fifth Semester
Civil Engineering
EN 8491 – WATER SUPPLY ENGINEERING
(Common to Environmental Engineering)
(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. What are the characteristics coliform organisms ?
2. Distinguish between carbonate hardness and non carbonate hardness.
3. Under what circumstances pumps are connected in series.
4. State any two characteristics of DI pipe.
5. State the mechanisms of disinfection process.
6. Bring out the difference between unit operation and unit process.
7. Why pretreatment is required for RO process ?
8. Distinguish between physical adsorption and chemisorption.
9. State the components of a house service connection.
10. What are the requirements of a good distribution system ?

PART – B **(5×13=65 Marks)**

11. a) The population of a town as per past census records are furnished below. Forecast the population in the year 2031 and 2041 using the following methods :
    i) Arithmetical increase method
    ii) Geometrical increase method
    iii) Graphical method.

Census Year	1941	1951	1961	1971	1981	1991	2001	2011
Population in thousand	34	40	46	57	63	72	79	101

(OR)

b) Explain the various characteristics of water and state their environmental significance.

12. a) Mention the points which should be taken into consideration in deciding the location of an intake for the water supply of a large town, the source being a perennial river. Draw a neat sketch of a river intake and explain the salient features.

(OR)

b) Discuss the factors to be considered while selecting pumps for water transmission. Draw a characteristics curve of centrifugal pump and explain the salient features.

13. a) Estimate the alum and quick lime requirements with reactions involved to treat 100 ML/d of water with raw water alkalinity of 9 mg/L as $CaCO_3$ if the alum dosage adopted was 40 mg/L.

(OR)

b) Explain the chlorine chemistry with the aid of suitable chemical equations and outline various forms of chlorination.

14. a) Draw a schematic diagram of a DM plant and explain the mechanism of cations as well as anions removal. Also briefly outline the design procedure.

(OR)

b) Design sodium based resin softener for an industry to produce 500 kL/d for the following data and draw a flow diagram of the unit.

Soft water requirement	=	500 kL/d
Raw water hardness	=	750 mg/L as $CaCO_3$
Product water hardness	=	50 mg/L as $CaCO_3$
Exchange capacity of the resin	=	45 kg($CaCO_3$)/m^3
Salt required for regeneration	=	100 kg(NaCl)/m^3 of resin

15. a) Discuss with neat sketches the various types of layout of distribution system and brief the advantages and disadvantages of various system.

(OR)

b) State briefly the basic principles governing the design of water supply in building with reference to quantity of flow and layout of the pipe system.

PART – C **(1×15=15 Marks)**

16. a) A new township is to have a population of 7,50,000 and 90 Lpcd of water supply. Design rapid sand filters with details of air and water washing including gutter arrangement. Limit the maximum spent backwash water as 3.5%.

(OR)

b) A municipal water supply source has a total dissolved solids concentration of 1200mg/L. Develop the design and size the various components of a reverse osmosis system, to produce finished water having a TDS concentration of less than 300 mg/L. The plant capacity is 21,000m^3/d. Use the following data :

Solvent Recovery factor, R = 75%

Salt-rejection factor, S = 95%

Design pressure, P = 4140 kN/m^2

Volume of single module = 30 L

Packing density = 820m^2/m^3

Flux rate, f = 0.82m^3/m^2/d.