B.E. / B.Tech. DEGREE END SEMESTER EXAMINATIONS, NOV/DEC 2013
CIVIL ENGINEERING BRANCH

FIFTH SEMESTER

CE9304 WATER SUPPLY ENGINEERING
(REGULATION - 2008)

Time: 3 hours   **Answer All Questions**   **Max.Marks: 100**

Instructions

(i)   Part A carries a maximum of 20 marks and Part B carries a maximum of 80 marks
(ii)   All questions in Part A carries 2 marks each and all question in Part B carries 16 marks each
(iii)   Make suitable assumptions wherever necessary and state them clearly.

PART A (10X2 = 20 Marks)

1.   State the objectives of public water supply system.

2.   What do you mean by MPN?

3.   What are the advantages of DI pipe over CI pipe?

4.   List out the forces acting on the underground pipe.

5.   What is the significance of weir loading in settling tank design?

6.   Enumerate the mechanisms of disinfection process.

7.   Under what circumstances is split treatment adopted in RO process?

8.   Distinguish between adsorption isotherm and adsorption kinetics.

9.   What are the components of house water supply service connection?

10.   List the requirements of good distribution system.

PART B (5X16 = 80 Marks)

11.   The population of a town panchayat 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) Incremental increase method.

Census year	1941	1951	1961	1971	1981	1991	2001	2011
Population	34642	40487	46816	55859	61458	68543	78131	106500

Estimate the water demand at 70 Lpcd for the year 2031 and 2041 by incremental increase method.

12.a)i) What are the important considerations, which govern the selection of site of an intake? (8)

ii) Discuss the factors to be considered in the selection of pipe material for water transmission? (8)

(OR)

b) A centrifugal pump with the following characteristics is installed in a system to raise water from one reservoir to another. The water surface elevation in the first reservoir is 150 m and that in the second reservoir is 200 m. The pipeline connecting the reservoirs is 3 km of 300 mm diameter. Determine the operating point in the system. Take $C_H = 110$. Also compute WHP and BHP of the pump assuming pump efficiency of 70%.

Pump discharge. Lpm	0	650	1400	2150	3000	3650
Total dynamic head, m	63.0	60.5	56.0	49.5	36.5	21.0

13.a) Design a clariflocculator for a proposed water treatment plant with a capacity of 30 ML/d and compare with the area required for individual units of clarifier and flocculator. Take viscosity as 0.89×10^{-3} N s/m^2, $C_D = 1.8$ and velocity of paddle as 0.45 m/s. Draw a neat sketch of the unit.

(OR)

b) Describe various methods of removing excess fluoride and iron from ground water.

14.a) i) Why and what pretreatment is required in the feed water to RO plant? (4)

ii) Design a zeolite softener for an industrial establishment working for 2 shifts of 8 hours each for the following data and draw a neat sketch of the unit. (12)

Soft water requirement = 2×10^6 L/d in 16 hours
Raw water hardness = 400 mg/L asCaCO$_3$
Product water hardness = 50mg/L asCaCO$_3$
Exchange capacity of the resin = 30 kg (CaCO$_3$)/m^3
Salt required for regeneration = 50 kg (NaCl) / m^3 of resin

(OR)

b) Determine the volume of cation and anion exchange beds to demineralize 250 m^3/d water that has the following chemical quality.

Cations	Anions
Ca^{2+} = 30 mg/L	HCO_3^- = 50 mg/L
Mg^{2+} = 4 mg/L	SO_4^{2+} = 45 mg/L
Na^+ = 25 mg/L	Cl^- = 40 mg/L
K^+ = 10mg/L	NO_3 = 10 mg/L

The ion exchange capacities of hydrogen cation and anion exchange resins are 75,000 and 40,000 g $CaCO_3/m^3$ cycle, respectively. Also, calculate the required quantities of regeneration chemicals. The regeneration cycle is once per day.

15) a) Find the flow in each pipe in the Loop shown in Fig.1. Use Hardy Cross method for analyzing the Loop. Consider C_H as 110 for all pipes
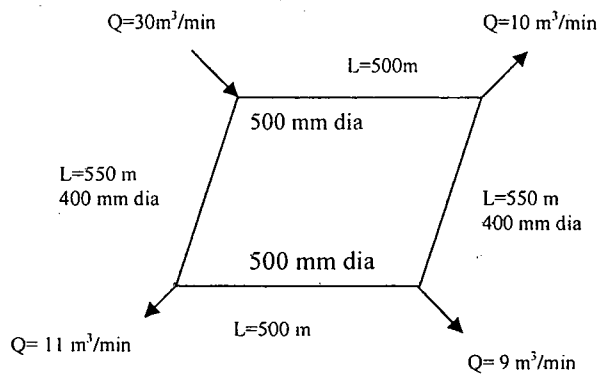

Fig.1.

(OR)

b) What are the functions of service reservoir? Briefly outline the design aspects of service reservoir.

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