
B.E. / B.TECH DEGREE END SEMESTER EXAMINATIONS, NOVEMBER/DECEMBER 2012
CIVIL ENGINEERING BRANCH

FIFTH SEMESTER

CE9304 WATER SUPPLY ENGINEERING
(REGULATIONS - 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 drinking quality standards for any four physico-chemical parameters.
2. What are the quality criteria for indicator organisms?
3. What is an intake?
4. Bring out the difference between CI pipe and DI pipe.
5. What is the significance of velocity gradient in flash mixer?
6. Distinguish between type-I and type-II settling.
7. What do you mean by adsorption capacity?
8. Distinguish between ultrafiltration and nanofiltration.
9. What is the function of service reservoir in distribution system?
10. Why are distribution storage tanks often elevated above the ground level by a tower?

PART B (5X16 = 80 Marks)

11. i) Enumerate and explain the characteristics of surface and ground water and state their environmental significance. (12)

ii) Mention and discuss the factors that influence per capita water demand. (4)

12.a)i) In a water supply scheme to be designed for serving a population of 12 lakhs, the storage reservoir is situated at 9 km away from the city and the loss of head from the source to city is 19.5 m. Calculate the size of the supply main by using Darcy-Weisbach formula as well as by using Hazen's formula assuming a maximum daily demand of 150 Lpcd and 2/3 of the daily supply to be pumped in 10 hours. Assume coefficient of friction (f) for the pipe material as 0.005 in Weishbach formula and C_H = 110 in Hazen's formula. (12)

ii) What are the factors to be considered in the selection of pipe material for water transmission? (4)

(OR)

12.b) i) Explain the difference between system head curve and pump head curve with the help of a diagram. (4)

ii) 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 200m. The pipeline connecting the reservoir 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 overall pump efficiency as 70%.

Pump discharge. Lpm	0	740	1600	2340	3160	3950
Total dynamic head, m	62.5	60.5	57.3	48.7	37.6	20.2

(12)

13.a) A new township is to have a population of 2,00,000 and 90 Lpcd of water supply. Design a rapid sand filter unit with details of under drainage and water washing including gutter arrangement. Limit the maximum spent backwash water as 3.5 %.

(OR)

b)i) Estimate the alum and quick lime requirements with reactions involved to treat 20 ML/d of water with raw water alkalinity of 10 mg/L as $CaCO_3$ if the alum dosage adopted was 34 mg/L. (8)

ii) Describe various methods of removing excess iron and manganese from ground water. (8)

14.a) Determine the volumes of cation and anion exchanger beds to demineralize 0.35ML/d water that has the following chemical quality.

Cations	**Anions**
Ca^{2+} = 30 mg/L	HCO_3^- = 50 mg/L
Mg^{2+} = 5 mg/L	SO_4^{2-} = 45 mg/L
Na^+ = 25 mg./L	Cl^- = 45 mg/L
K^+ = 10 mg/L	NO_3^- = 10 mg/L

The ion exchange capacities of cation and anion exchange resins are 70,000 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.

(OR)

14.b) A municipal water supply source has a total dissolved solids (TDS) concentration of 1200 mg/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 19,000 m^3/d. Use the following data:

Plant design capacity: Q	19,000 m^3/d
Recovery factor: R	75 percent
Salt-rejection factor, S	95 percent
Design pressure, P	4140 kN/m^2
Feed water temperature, T	27°C
TDS in raw water	1200 mg/L
TDS in finished water	300 mg/L
Flux rate, f	0.82 $m^3/m^2/d$

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) A town requires a water supply of 60 lakhs litre per day. Estimate the storage capacity of service reservoir required for the demand shown in the table for 16 hours continuous pumping from 4.00 am. Also express the capacity as percentage of daily demand.

Time in hours	0-4	4-5	5-7	7-9	9-12	12-14	14-16	16-20	20-24
Demand/hour	0.25a	1.25a	2.25a	1.50a	1.25a	1.00a	1.75a	1.00a	0.25a

Where 'a' is the average demand of water per hour.

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