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**Question Paper Code : 27124**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Fifth Semester

Civil Engineering

CE 6503 — ENVIRONMENTAL ENGINEERING — I

(Regulations 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List out the components of a public water supply system.
2. What do you mean by design period?
3. What are the advantages of DI pipe over CI pipe?
4. Distinguish between unit operation and unit process.
5. What is the significance of velocity gradient in flash mixer design?
6. Enumerate the mechanisms of disinfection process.
7. What do you mean by adsorption capacity?
8. Distinguish between ultrafiltration and nanofiltration.
9. List out the methods to reduce wastage of water in a distribution system.
10. List the requirements of good distribution system.

PART B — (5 × 16 = 80 marks)

11. (a) The population of a town as per census record is 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 :	1931	1941	1951	1961	1971	1981	1991	2001	2011
Population :	22300	35642	49487	55816	65859	79458	95543	110131	129500

Estimate the water demand at 90 Lpcd for the year 2031 and 2041 by incremental increase method.

Or

- (b) Enumerate and explain the characteristics of surface and ground water and state their environmental significance.
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 150m and that in the second reservoir is 200m. The pipeline connecting the reservoir is 3 km of 300mm 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) (i) Estimate the alum and quick lime requirements with reactions involved to treat 100 MLD of water with raw water alkalinity of 9 mg/L as  $\text{CaCO}_3$  if the alum dosage adopted was 40 mg/L. (12)
- (ii) Briefly explain the role of sedimentation tank in water treatment. (4)

Or

- (b) A new township is to have a population of 5,00,000 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%.



14. (a) (i) Why and what pretreatment is required in the feed water to RO plant? (6)
- (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. (10)

Soft water requirement =  $2 \times 10^6$  L/d in 16 hours

Raw water hardness = 400 mg/L as  $\text{CaCO}_3$

Product water hardness = 50mg/L as  $\text{CaCO}_3$

Exchange capacity of the resin = 30 kg ( $\text{CaCO}_3$ )/ $\text{m}^3$

Salt required for regeneration = 50 kg ( $\text{NaCl}$ )/ $\text{m}^3$  of resin.

Or

- (b) Enumerate and explain the various methods of removal of iron and manganese from groundwater.
15. (a) Find the flow in each pipe in the Loop shown in Fig. 15 (a). Use Hardy Cross method for analyzing the Loop. Consider  $C_H$  as 110 for all pipes.

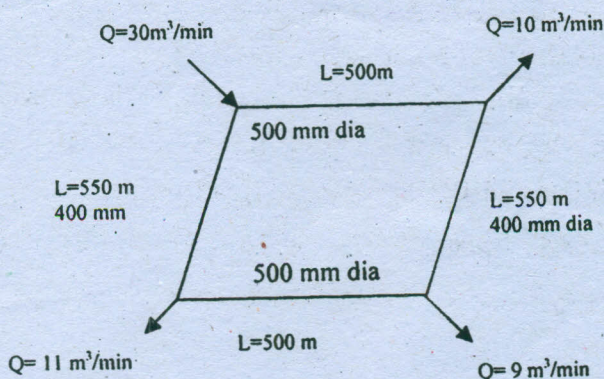


Fig. 15 (a)

Or

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