



P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Fifth Semester, B.E. - Civil Engineering

Semester End Examination; Dec. - 2015

Water Supply Engineering

Time: 3 hrs

Max. Marks: 100

- Note:** i) Answer **FIVE** full questions, selecting **ONE** full question from each **unit**.
ii) Assume missing data suitably.

UNIT - I

- 1 a. List the various types of water demands of a city. Explain any one of them in detail. 6
b. What is per capital demand? Explain the factors affecting per capita demand of a city. 6
c. Estimate the population of a town in 2021 AD by arithmetical increase method and incremental increase method from the following data. 8

Year	1971	1981	1991	2001	2011
Population	18,000	22,000	27,000	32,500	37,400

- 2 a. What are intakes? What points should be kept in mind while selecting a site for intake works. 6
b. Describe briefly the possible sources of water for public water supply for a city. What are the factors which govern the final choice of the source? 6
c. From a clear water reservoir 3.0 m deep and maximum water level 30.00 m, water is pumped to an elevated reservoir at 75.00 m at the constant rate of 0.9 million litres/hour. The distance is 1500 m. Give the economical diameter of the rising main and water horse power (WHP) of the pump. Neglect minor losses and take $f = 0.01$. 8

UNIT - II

- 3 a. Explain briefly, any four water borne diseases and their causative organisms. 6
b. What do you mean by wholesome water? What are the requirements of wholesome water? 6
c. Give the complete sequence of water treatment plant, with a flow diagram. Briefly explain the type of impurities removed in each unit. 8
4 a. Describe in brief various tests conducted for physical examination of water. 6
b. What are indicator organisms? Explain the significance of indicator organisms in evaluating the quality of drinking water. 6
c. Give the health significance and maximum permissible limits as per BIS: 10500-1991, the following water quality parameters; i) Fluoride ii) Nitrate iii) Alkalinity iv) Iron 8

UNIT - III

- 5 a. List different types of aerators commonly used in water treatment plants. Explain any one with a neat sketch. 6
b. What is meant by discrete setting? Derive an expression for settling velocity of discrete particles in a sedimentation tank. 6

- c. A sedimentation tank of size 50 m x 15 m x 3.5 m (0.5 m free bond) is designed to treat 5 million litres of water per day. Determine; 8
 (i) Detention period (ii) Horizontal velocity (iii) Overflow rate (iv) Settling velocity.
- 6 a. Show that the efficiency of a sedimentation tank is independent of its depth. 6
 b. What are the various chemical coagulants which are commonly used in coagulation process? How they remove suspended impurities? 6
 c. For a continuous flow settling tank 3m deep and 60 m long, design and flow velocity of water for effective removal of 0.025 mm particles at 25° C. The specific gravity of particles is 2.65 and kinematic viscosity for water may be taken as 0.01 cm²/sec. 8

UNIT - IV

- 7 a. Explain the theory of filtration as used in the purification of water. 6
 b. What are the merits and demerits of the rapid sand filters as compared with the slow sand filters? 6
 c. Design 4 set of rapid sand filter beds to treat 30 m³/d of water making 2% allowance for wash water. Assume the filter back wash period as 1 hour/day. Rate of filtration = 4000 liters/hour/m². 8
- 8 a. Explain break point chlorination with the help of a neat sketch. What is its significance in disinfection of public water supply? 6
 b. What is meant by: i) Super chlorination ii) Pre-chlorination iii) Plain - chlorination 6
 c. Chlorine usage in the treatment of 25,000 m³/day of water is 9 kg/day. The residual chlorine after 10 minutes contact is 0.2 mg/l. Calculate the dosage in mg/l and the chlorine demand of the water. 8

UNIT - V

- 9 a. What are the various methods which are commonly used for the removal of colour, odour, and taste from the water? Describe any one in detail. 6
 b. What do you mean by defluoridation of water? Explain any one of the methods of defluoridation in detail. 6
 c. What is meant by hardness of water? How it is expressed? Describe the method of softening by zeolite process. 8
- 10 a. Write a brief note on fire hydrants. 6
 b. What are the characteristics of a good water meter? List important merits and demerits of metering. 6
 c. Calculate the storage required to supply the demand shown in the following table, if the inflow of water to the reservoir is maintained at a constant rate throughout 24 hours. 8

Time	0 - 4	4 - 8	8 - 12	12 - 16	16 - 20	20 - 24
Demand(million litres)	0.48	0.87	1.33	1.00	0.82	0.5