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

(An Autonomous Institution affiliated to VTU, Belagavi)

Fifth Semester, B.E. - Civil Engineering

Semester End Examination; Dec. - 2019

Water Supply Engineering

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT -I

1 a. Discuss the necessity of protected water supply 6

b. Write a short note on fire demand in water supply 6

c. The population as per the census reports of a city is given below. Determine the excepted population for the year 2021 by;

i) Geometrical increases method

ii) Incremental increase method 8

Census year	1921	1931	1941	1951	1961	1971	1981
Population	25000	27500	34100	41500	47050	54500	61000

2 a. What are the factors that govern the location of an intake? 6

b. Define;

i) Wholesome water ii) Palatability iii) Potable water 6

c. Water has to be supplied to a town with one lakh population at the rate 150 liters per capita per day from a river 2 km away. The difference between the lowest water level in the sump and the reservoir is 36 m. If the demand has to be supplied in 8 hours, Determine the size of the main and brake horse power of the pumps required. Assume maximum demand as 1.5 times the average demand. Assume f = 0.03, velocity in the pipe as 2.4 m/s and efficiency of pump as 80%. 8

UNIT - II

3 a. Give the maximum permissible limits as per the BIS for the following water quantity parameters:

i) Fluoride ii) Iron

iii) Total hardness iv) Nitrate 8

Also indicate their health significance.

b. What is aeration of water? Discuss in detail different methods of aeration of water. 12

4 a. What are the objectives of water treatment? 6

b. Write a note chemical characteristics of water 8

c. What is the significance of E coil in water analysis? 6

Contd…2

UNIT - III

5 a. Define 'flowing through period' and 'detention period' in a sedimentation tank. 6

b. Determine the settling velocity of a discreet particle in water when Reynolds number is less than 0.5 The diameter of particle is 0.05mm and specific gravity is 2.65. The kinematic viscosity of water at 20°C is 1.01×10^{-2} cm^2/s) 6

c. Everyday a water treatment plant has to supply 20 MLD of water to a city. Design the dimension of suitable sedimentation tank for the raw water supplies, assuming a detention period of 6 hours and velocity of flow in the tank as 0.2 m/minute. 8

6 a. Why alum is commonly used coagulant? Write down the reaction. Compare Alum with Iron salts as coagulation. 10

b. A coagulation sedimentation tank clarifies 40 MLD of water every day. The quantity of filter alum required at the plant is 18 mg/L. If the raw water is having an alkalinity Equivalent to 5mg/L CaCO3, Determine the quantity of filter alum and quick lime (containing 85% of CaO) required per year by the plant. Given the molecular weights as (A1 = 27, S = 32, O = 16, H = 1, Ca = 40, C = 12) 10

UNIT - IV

7 a. What are the operational problems encountered in rapid sand gravity filters. How are they avoided? 10

b. Design a rapid sand filter for a population of 1 lakh which is to be served by 200 liters/head/day water supply. Assume whatever data are necessary and not given. 10

8 a. What do you understand by chlorination? Explain its action in killing bacteria. 10

b. Discuss the various forms in which chlorine can be applied to water as a disinfectant 5

c. Calculate chlorine usage in the treatment of 20000 m^3 water per day is 8 kg/day The residual chlorine after 10 minutes contact is 0.20 mg/L. Calculate the dosage in mg/l and chlorine demand of the water. 5

UNIT - V

9 a. Explain the Nalogonda technique of defluoridation of water with a neat sketch 6

b. Describe hardness of water. Explain the zeolite process for treating hard water. 6

c. With a neat sketch explain dead end system and grid iron system of water distribution networks. 8

10 a. What are the requirements of a good distribution system? 6

b. Write short notes on; 6

i) Hardy cross method ii) Fire Hydrant

c. Explain the methods used for detection of leakage of water from the underground water mains. 8

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