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15CV64

Sixth Semester B.E. Degree Examination, '69201- an.2020
Water Supply and Treatment Engineering

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain the need and importance of protected water supply to a community. (05 Marks)
- b. Explain briefly different types of water demand. (05 Marks)
- c. Briefly explain :
 - (i) Factors affecting per capita demand of water.
 - (ii) Factors affecting design period (06 Marks)

OR

- 2 a. List different methods of populations forecasting. Explain briefly any two methods. (08 Marks)
- b. The population census of a city is as shown in the following table. Estimate the expected population of the city by 2041 using arithmetical increase method and geometrical increase method.

| Year | 1971 | 1981 | 1991 | 2001 | 2011 |
|---------------------|------|------|------|------|------|
| Population in lakhs | 1.50 | 1.85 | 2.18 | 2.50 | 2.85 |

(08 Marks)

Module-2

- 3 a. What are the objectives of water treatment? Draw a flow chart of conventional water treatment plant and indicate various units. (08 Marks)
- b. Classify various sources of water and explain briefly their suitability with respect to quantity and quality for a town. (08 Marks)

OR

- 4 a. What is sampling of water? Discuss the objectives of sampling and preservative techniques. (06 Marks)
- b. Explain briefly physical, chemical and bacteriological water quality characteristics. (06 Marks)
- c. Give the maximum permissible limits as per the BIS for the following water quality parameters:
 - (i) Total hardness
 - (ii) Fluoride
 - (iii) Nitrate
 - (iv) Iron. (04 Marks)

Module-3

- 5 a. What is Sedimentation process? With the help of sketch of an ideal settling tank, show that the efficiency of the settling tank is independent of its depth. (05 Marks)
- b. Design a set of three circular settling tanks to handle 6 million litres of water per day. Take detention time as 4 hours and side water depth as 3m. Check for the design and sketch the designed tank. (06 Marks)
- c. What is coagulation of water? Estimate the quantity of alum required per month at a treatment plant to treat 10 MLD of water with alum dosage of 20 mg/C. (05 Marks)

OR

- 6 a. Briefly explain the mechanism of filtration. (04 Marks)
- b. With the help of a sketch explain the working of a rapid sand filter. (06 Marks)

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- c. Design a set of Ten slow sand filter units to treat water for a town of 2 lakh population with assured water supply of 135 lpcd and maximum daily water is 1.5 times the average demand. The rate of filtration is 200 litres per square metre per hour (06 Marks)

Module_4

- 7 a. What are the objectives of water softening? Give a comparison of Lime - Soda process with Zeolite process of water softening. (05 Marks)
- b. A river was proposed as the raw water source for a near by town. Chemical analysis of the water indicates the constitutes as given below. if the hardness of water supplied to the residents is to be limited to 160 mg/t, determine the need of softening if any.
- | | |
|---------------------------|----------------------------|
| Zn = 4 mg/C | Na ⁺ = 18 mg/f. |
| CC ⁻ = 68 mg/C | Mg ²⁺ = 16 mg/C |
| SO ⁻ = 20 mg/C | Ca ²⁺ = 60 mg/C |
| Turbidity = 45 mg/f | Alkalinity = 45 mg/C |
- Given equivalent weight of Ca²⁺ = 20; Mg²⁺ = 12.2 and CaCO₃ = 50. (05 Marks)
- c. Estimate the quantity of Zeolite required to soften 2 MLD of water with hardness 360 mg/f which should be reduced to 60 mg/C. The interval between successive regeneration 4 hours and the capacity of exchanger is 24000 grams/cu.m. (06 Marks)
- 8 a. What is disinfection of water? What are the requirements of a good disinfectant? (04 Marks)
- b. A college hostel having 500 students used well water for drinking. The rate of water supply is 120 lpcd. The water is to be disinfected using bleaching powder containing 25% chlorine available. Determine the monthly requirement of the bleaching powder with the following data:
- Chlorine demand of well water = 1.2 mg/C
 - residual Chlorine expected = 0.2 mg/f
- (06 Marks)
- c. Write a note on : (i) Fluoridation (ii) De-fluoridation (06 Marks)

Module_5

- 9 a. What are intake works? What are the factors to be considered for selection of site intake structures? (05 Marks)
- b. Write a note on : (i) Pumps and their types (ii) Pipe materials and pipe appurtenances (06 Marks)
- c. A town with prospective population of 80,000 is to be supplied with water from a river 5 km away and 25m below the level of the town. Design the economical section of the rising main and pumping unit where power is available. Take water supply rate as 150 lpcd and $f = 0.01$. Assume other relevant details if required. Given pumping hours = 12/day. (05 Marks)

OR

- 10 a. Explain the various methods of water distribution system. (05 Marks)
- b. For the water supply of a small rural town with the population of 10,000 with the rate of water supply as 100 lpcd. It is proposed to construct a distributing reservoir. The pattern of draw off is as under.
- | | | |
|---------------|-------|--------------------|
| 5 am to 10 am | | 75% of days supply |
| 10 am to 4 pm | | 10% - " - |
| 4 pm to 9 pm | | 13% - " - |
| 9 pm to 5 am | | 2% - " - |
- The pumping is to be done for 8 hrs per day (8 am to 4 pm). Determine the storage capacity of the reservoir. (06 Marks)
- c. Write a note on different types of water distribution reservoir. (05 Marks)