Code No: **R1632013** **R16** SET - 1

III B. Tech II Semester Regular/Supplementary Examinations, August-2021

ENVIRONMENTAL ENGINEERING – I

(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A **(14 Marks)**

1. a) List out the factors affecting per capita water demand. [2M]
   b) What are the impurities present in water? [2M]
   c) What is the necessity of treatment of water? [2M]
   d) Explain the operational troubles in filters. [3M]
   e) Explain the significance of softening of water. [3M]
   f) What are the requirements for distribution of water? [2M]

PART –B **(56 Marks)**

2. a) What are the different types of forecasting methods for estimating future population of a city? Explain any two methods. [6M]
   b) The present population of a community is 42000 with an average consumption of water of 6300 m^3/d. The existing water treatment plant has a design capacity of 9000 m^3/d. It is expected that the population will increase to 66000 during the next 20 years. Considering an arithmetic rate of population growth, find number of years from now when the plant will reach its design capacity? [8M]

3. a) Differentiate between the gravity and pressure conduits. [6M]
   b) Explain and compare the quality and quantity of water supplies that may be available from various sources. [8M]

4. a) Explain the physical and chemical characteristics of water. [6M]
   b) A water sample contains the following dissolved ions: [Na^+]= 56 mg/L; [Ca^{2+}]= 40 mg/L; [Mg^{2+}]= 30mg/L; [$A1^{3+}$] = 3mg/L; [HCO_3]=190 mg/L; [Cl^-]= 165 mg/L; Water pH is 7. Atomic weights: Ca:40; Mg:24; Al:27; H:1; C:12; O:16; Na:23; Cl:35.5. Determine the total hardness, carbonate hardness and non-carbonate hardness of the sample as $CaCO_3$. [8M]
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5. a) Explain briefly about working and cleaning of rapid sand filters. [6M]
   b) A plain sedimentation tank with a length of 20 m, width of 10 m, and a depth of 3 m is used in a water treatment plant to treat 4 million liters of water per day. The average temperature of water is 20^0C. The dynamic viscosity of water is 1.002×10^{-3} N.s/m^2 at 20^0C. Density of water is 998.2 kg/m^3. Average specific gravity of particles is 2.65. Find the surface overflow rate in the sedimentation tank. [8M]

6. a) Explain in detail about zeolite process for removing hardness. [7M]
   b) What do you mean by desalination? Explain about desalination by reverse osmosis process. [7M]

7. a) Explain the different types of valves used in the water distribution system. [6M]
   b) Explain the different methods of distribution of water. Mention their advantages and disadvantages. [8M]

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