Total No. of printed pages = 4

19/5th Sem/UCE504

2021

ENVIRONMENTAL ENGINEERING – I

Full Marks – 100

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer any *five* questions.

1. (a) Define Aeration and Aerator. What are the objectives of aeration process ? Mention the various types of aerator and explain any one of them in detail. 6

   (b) What are the common impurities found in natural sources of water and their effects upon its quality ? 6

   (c) A rectangular sedimentation tank is to handle 20 million litres/day of raw water. A sedimentation basin width to length ratio of 1/5 is proposed to trap all particles larger than 0.05 mm in size. Assume a relative

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density of 2.62 for the particles and 25°C as the average temperature, determine the basin dimensions. If the effective depth of tank is 3 m, calculate the detention time. 6

(d) Find the settling velocity of silica particles of specific gravity 2.65 at 20°C, if the diameter of particles is 0.02 cm. 2

2. (a) Explain the various systems adopted for distribution of water. 5

(b) Differentiate between Ring system and Radial system. 4

(c) Describe CI pipes and steel pipes and give their comparison. 5

(d) Show that the settling velocity of a spherical particle in a liquid under condition when Reynold's number less than 0.5 may be given by the expression $V_s = g/18\,(Gs-1)\,d^2/\upsilon$. 6

3. (a) Distinguish between Slow sand filter and Rapid sand filter with reference to (i) rate of filtration (ii) period of filtration (iii) method of cleaning (iv) filter media of sand. 6

(b) Describe the working of Slow sand filter with the help of neat sketch. 8

(c) What are the action takes place during filtration ? 6

4. (a) Define detention period and flow through period in sedimentation tank. 4

(b) How will you estimate the quantity of water to be stored in the distribution reservoir ? 6

(c) What do you understand by 'Coagulation and Flocculation' ? Explain the mechanism of Floc formation. 5

(d) What is the difference between Disinfection and Sterilization ? Mention the various disinfecting agents. 5

5. (a) Design a rapid sand filter to treat 5 million litres of raw water per day allowing 5% of filtered water for backwashing. Half hour per day is used for backwashing. The rate of filtration is 5000 $l/h/m^2$ of bed. Assume necessary data. 15

(b) Explain the electro-dialysis method of desalination. 5

6. (a) A city has a population of 80,000. Water is to be supplied at the rate of 150 litres per head per day. If the water is pumped from a river 4 km away in to reservoir. The level difference between water in river and reservoir is 30 m, calculate HP of pump, if pump are to operate for total of 10 hours with efficiency of 80%. Assume f = 0.03, velocity of flow 3m/s and maximum daily demand as 1.8 times the average demand. 6

(b) Discuss, the advantages and disadvantages of various types of pipes used in water supply. 8

(c) Explain the various layout of distribution system. 6