53 (CE 404) EVEN

2012 C
2013
(May)

ENVIRONMENTAL ENGINEERING – I

Paper : CE 404

Full Marks : 100

Pass Marks : 30

Time : Three hours

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

*Answer **any five** questions.*

1. *(a)* What do you understand by treatment of water ? Why is it necessary ? Give an outline of various processes adopted for treatment of water. 8

   (b) Classify various types of sedimentation tank. A rectangular sedimentation Basin is to handle 12 million litres per day of raw water, a sedimentation basin of width to length ratio of 1/3 is proposed to trap all particles larger

than 0.05 *mm* in size. Assume a relative density of 2.62 for the particles and 20°*C* as the average temperature, determine the Basin dimensions, if the effective depth of the tank is 3*m*. Calculate detention time. 8

(c) What are the requirements of good distribution system ? 4

2. (a) Briefly discuss the physical water quality parameters. 10

(b) From a clear water reservoir 2.5*m* deep and maximum water level at 32.00*m*, water is to be pumped to an elevated reservoir at 80.00*m* at a constant rate of 8,10,000 *litres* per hour, the distance is 1200*m*. Give the economical diameter of the rising main and the water horse power of the pump. Neglect minor losses and take $f = 0.04$. 6

(c) Explain the various methods of disinfection. 4

3. (a) Describe with the help of sketches, a slow sand filter. Explain its working. 6

(b) Classify various types of filters. Differentiate between Slow sand and Rapid sand filters. 4

(c) Explain the nitrogen cycle with the neat sketch. 5

(d) Calculate the quantity of bleaching powder required per day for disinfection of 4 million *litres* per day. The dose of the chlorine has to be 0.5 *ppm* and the bleaching powder contains 30% of available chlorine. 5

4. (a) Explain the following : 10

(i) Zeolite process

(ii) Lime soda process

(iii) Deflouoridation

(iv) Turbidity Rod

(v) Demineralization.

(b) Find the diameter of the particle with specific gravity of 1.2 removed in a tank having a surface area of $250m^2$ and treating 8 million *litres* of water per day. Assume temperature = $26°C$. 4

(c) Discuss with the help of diagram various methods of laying out the distribution system. 6

5. *(a)* Write notes on the various forms of Chlorination. 10

(b) What is meant by Coagulation ? What are the common coagulants used ? Describe the chemical reaction involved when the coagulant are used. 6

(c) Write short notes on the following : 4

(i) total solid

(ii) pH value

(iii) BOD

(iv) Floculation.

6. *(a)* Define Ecology and Ecosystem. Describe the structure of Ecosystem. 4

(b) Differentiate between : 6

(i) temporary and permanent hardness

(ii) E-Coli and B-Coli

(iii) intermittent and continuous system of supply.

(c) Explain various filter troubles and its remedial measures. 5

(d) What are the various mixing devices commonly used ? What is flash mixer. 5

7. (a) Show that the settling velocity of a spherical particle in a liquid under condition when Reynold's number is less than 0.5 may be given by expression 10

$$V_S = g/18\,(S_S - 1)\,\frac{d^2}{\nu}$$

(b) Write short notes on the following : 10

(i) Distribution reservoirs

(ii) Aeration in water treatment process.
