Total No. of printed pages = 4

19/3rd Sem/DCE304

2021

ENVIRONMENTAL ENGINEERING

Full Marks –100

Time –Three hours

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

Answer any *five* questions.

1. (a) Explain in brief the various process which are generally adopted for treating public water supplies. 6

   (b) What are the objectives of screening process ? Explain the various types of screens used for screening process. 5

   (c) Design a plain sedimentation tank to treat 5 million litres water per day. Take a detention period of 8 hours and assume a depth of 3.5m. 5

   (d) What are the common impurities found in natural sources of water and their effects upon its quality ? 4

[Turn over

2. (a) Find the settling velocity of silica particles of specific gravity 2.65 at 20^0C, if the diameter of particles is 0.005 cm. 3

(b) What do you understand by coagulation and flocculation? What are the various factors affecting coagulant? Describe the various types of coagulant commonly used in water treatment plant. 7

(c) A city has a population of 80000 with an average rate of demand of 160 litres per head per day. Find the area of rapid sand filters. Assume an average filtration rate of 5000 litres per hour per m^2 of filter area. 4

(d) What are the requirements of good distribution system? Discuss with the help of diagrams, various methods of laying out the distribution system. 6

3. (a) Classify the various types of filters. Differentiate between the slow sand filter and rapid sand filter. 6

(b) A combined sewer is to be designed to serve an area of 60 sq.km with an average population density of 185 persons per hectare. The average rate of sewage flow is 350 LCPD. The maximum flow is 50% in excess of the average sewage flow. The rainfall equivalent of 12 mm in 24 hours can

be considered for design, all of which is contributing to surface runoff. What will be the discharge in the sewer ? Find the diameter of the sewer if running full at maximum discharge. 6

(c) Define the following terms : 8

(i) Detention period

(ii) Surface loading

(iii) Flow through period and

(iv) Displacement Efficiency.

4. (a) For a small town having projected population of 40,000 residing over an area of 30 hectares, find the design discharge for the combined sewer for the following data : Rate of water supply =150 litres per capita per day, Runoff coefficient = 0.4, Time of concentration = 30 min. 4

(b) Define the following terms : 4

(i) Self-cleansing velocity and

(ii) Non-scouring velocity.

(c) Calculate the velocity of flow and discharge in a sewer of circular section having diameter 50 cm, laid at the gradient of 1 in 100. Use manning formula taking N = 0.013. Assume sewer is running half full. 6

(d) Discuss the mechanism of working of oxidation pond. 6

5. (a) State the factors on which the storm water flow on an area depends. 5

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

6. (a) What is meant by self-purification of stream ? What are the various factors affecting self-purification of polluted streams ? 7

(b) Explain the rational method of estimating storm water flow. 6

(c) Explain the various types of distribution reservoir. 7