53 (CE 602) EVEN

2017

ENVIRONMENTAL ENGINEERING–II

Paper : CE 602

Full Marks : 100

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 unit operations and process? What is its importance in water and waste water treatment? Elaborate various types of unit operation used for waste water treatment. 15

   (b) Explain with the help of diagram, single stack system and partially ventilated single stack system. 5

2. (a) Design a septic tank for the following:

No. of persons : 100

Sewage/capita/day : 120 litres

Desulding period : 1 year and

discuss advantages and disadvantages of a septic tank. 10

(b) The sewage flows from a primary settling tank to a standard rate trickling filter at a rate of 5 million litres per day having a 5-day BOD of 150mg/l. Determine the depth and the volume of the filter, adopting a surface loading of 2500l/m^2/day and an organic loading of 150g/m^3/day. Also determine the efficiency of the filter unit using NRC formula. 10

3. (a) Enumerate various treatment techniques used for biological treatment of waste water. 6

(b) Explain the terms soil pipe, waste pipe, Anti siphonage pipe. 6

(c) Discuss *any one* method of disposal of septic tank effluent. 8

4. Design an Imhoff tank to treat the sewage from a small town with the population of 30,000 persons with sewage flow rate of 180 litres per day, assume effective depth and width as 1·5*m* and 3*m* respectively. 20

5. *(a)* Explain the mechanism of purification in facultative ponds. 5

(b) Explain in brief various operational problems commonly encountered in the activated sludge plant. 5

(c) Design an oxidation pond for treating domestic sewage contributed by 10,000 persons supplied with water at 200 litres per person per day. The BOD and suspended solids are 300*mg/l* each permissible organic loading for the pond is not less than 500*kg/ha*/day, the detention period is not to exceed 6 days. Assume width to length ratio as 1·5 : 3 and operational depth as 1·2*m* sewage, volume may be taken equal to water supplied. 10

6. *(a)* Determine the size of a high rate trickling filter for the following data : 8

(i) Final effluent BOD desired = 25*mg/l*

(ii) BOD removal in primary clarifier = 30%

(iii) BOD of raw sewage = 230*mg/l*

(iv) Recirculation ratio = 1·5

(v) Sewage flow = 5*ml/D.*

(b) Write short notes on the following : 12

(i) Tapered aeration process

(ii) Step aeration process

(iii) Ridge and furrow type aeration system

(iv) Activated sludge process.
