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Roll No.

CE-703

B. E. (Seventh Semester) EXAMINATION, June, 2009

(Civil Engg. Branch)

ENVIRONMENTAL ENGINEERING – II

(CE – 703)

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt *one* complete question from each Unit. Each full question is of 20 marks.

Unit – I

1. (a) What is partially combined system of sewerage ? Why is it considered most suitable for Indian conditions ? 5
- (b) Discuss the variation in rate of sewage. What are its effects on the design of sewer ? 5
- (c) A circular sewer carries a discharge of 700 litres per second running half full. Determine the size of sewer with the following assumptions : 10
 - (i) $S = 0.0001$
 - (ii) $N = 0.015$

Or

- (a) Discuss the comparative merits and demerits of the separate system and combined system of sewerage. 6

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- (b) What are the various methods of cleaning of sewer ? Describe in brief. 4
- (c) A sewer line is laid to serve a community of 150 persons/ha. in a colony of 30 ha. The average water supply is 225 l/c/d. The available ground slope is 1 in 600. Using Manning's formula with $n = 0.015$, select a suitable diameter of sewer to carry the peak discharge, flowing half-full in the section. Check the velocity for self-cleansing section. 10

Unit – II

2. (a) Describe the aerobic and anaerobic cycles taking parts in stabilization of organic matter in nature. 10
- (b) If 5-day 20°C BOD is 225 mg/l, what would be its 8-day BOD at 15°C temperature ? Assume the deoxygenation coefficient $K_D = 0.15$ at 20°C . 10

Or

- (a) What is land treatment ? Discuss the conditions under which it is suitable. 10
- (b) If the contribution of suspended solids and BOD is 90 gm and 75 gm per capita per day, estimate the population equivalent of (i) A combined system serving 1200 persons and having 125 gm per capita daily BOD and (ii) 50000 litres daily contribution of industrial wastes containing 1800 kg/lit. of suspended solids. 10

Unit – III

3. (a) What do you understand by grit chambers ? Write the various design parameters with its neat sketch. 10
- (b) Explain the construction and working of contact bed with their advantages and disadvantages. 10.

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Or

- (a) What do you understand by the efficiency of a trickling filter ? 5
- (b) Discuss in brief various design parameters used for settling tank. 5
- (c) A single stage filter is designed for an organic loading of 10000 kg of BOD in raw sewage per hectare metre per day with a recirculation ratio of 1.2. This filter treats a flow of 4 m³/d of raw sewage with a BOD of 220 mg/l. Using NRC formula determine the strength of the effluent. (Assume that primary clarifier removes 30% of BOD). 10

Unit – IV

- 4. (a) Describe the biochemical mechanism of the activated sludge process. 6
- (b) Define F/M ratio and S. V. I. 4
- (c) Design an oxidation pond for treating domestic sewage of 1000 persons supplied with 200 litres per capita water per day. The BOD and the suspended solids are each of 300 mg/l. Permissible organic loading for the pond is not less than 500 kg/ha/day. The detention period is not to exceed 6 days. Assume the width of the pond to its length as 1 : 2 and the operational depth as 1.2. Assume any other suitable data. 10

Or

- (a) Explain in brief various methods used for aeration in the activated sludge process. 10
- (b) Design the dimensions of a septic tank for a small colony of 200 persons provided with an assured water

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supply from water works at a rate of 135 lit/capita/day.

Assume : 10

- (i) 85% water converted into sewage.
- (ii) Rate of sludge deposition – 30 litres/capita/year.
- (iii) The period of cleaning – 2 years.

Unit – V

- 5. (a) Discuss in brief the biological and chemical methods of removal of phosphorous from waste water. 10
- (b) Explain how do you collect and dispose off (i) dry refuse (ii) sullage and (iii) night soil in rural area. 10

Or

- (a) Explain the Bangalore method of composting. 5
- (b) Describe in detail the granular media filtration methods of suspended solid removal during advanced waste water treatment. 10
- (c) Enumerate various types of previes used in rural area. Explain any *one* in detail with neat sketch. 5