Roll No.....

CE-703

B.E. VII Semester

Examination, December 2012

Environmental Engineering - II

Time : Three Hours

Maximum Marks : 100 ***Minimum Pass Marks :35***

Note : 1. Attempt five questions.
2. All questions carry equal marks.
3. Part A and B should be attempted of the same question.

UNIT - I

1. a) What do you mean by variation in flow of sewage? Indicate the ratios of maximum flow to average flow, to be adopted in the design of laterals, branches, mains and trunk sewers. Explain the importance of the following in the design of sewers:

   i) Self-cleansing velocity and

   ii) Non-scouring velocity (10)

   b) Describe the method of construction of large size brick or R.C.C. sewers laid in deep trenches in city area? What safety precautions would you employ to protect workmen and traffic during such construction. Supplement your answer with neat sketches? (10)

OR

2) a) Describe the factors affecting choice of a particular material for sewer construction. Discuss the relative advantages and disadvantages of cement concrete pipes? (10)

b) Under what circumstances is pumping of sewage necessary? What types of pumps would you recommend for pumping sewage and why? Propose suitable pumping units to pump (1 million liter/day average flow) sewage from 2 KM away and 10m above the level of the outfall sewer level? (10)

UNIT-II

3) a) Give the typical composition of strong domestic wastewater. What are the characteristics of sewage? How various constituents of sewage influence the characteristics? (10)

b) The average sewage flow from a city is 80×10^6 l/d. If the average 5 days BOD is 285 mg/l, compute the total daily 5-day oxygen demand in kg, and the population equivalent of sewage. K = 0.1. Assume per capita BOD of the sewage per day = 75 gm. (10)

OR

4) a) Explain the importance of determination of solids in sewage. How do you determine the suspended solids in a given sample of wastewater? (10)

b) Write a note on BOD. Deduce an expression for BOD with time? What are the factors on which the deoxygenation constant (K_D) depends. (10)

UNIT-III

5) a) What do you understand by grit chambers? Why it is necessary to provide a grit chamber? Explain the configuration of a grit chamber with the help of neat sketches? (10)

b) What is a proportional flow weir? How do you determine the geometry of such a weir? (10)

OR

6) a) What are the advantages and disadvantages of coagulation process in sewage treatment? (10)

b) A town having a population of 30000 is producing the following sewage:

i) Domestic sewage @ 120 lpcd having BOD of 200 mg/l.

ii) Industrial sewage @ 3 lakh liter per day having BOD of 800 mg/l.

Design high rate single stage tricklingfilters for treating the above sewage. Assuring that the primary sedimentation removes 35% of the BOD. Allow an organic loading of 10000 kg/ha-m/d (excluding recirculated sewage). The recirculation ratio is 1.0; and the surface loading should not exceed 170 million liter/hactare/day (including recirculated sewage). Determine the efficiency of the trickling filter and the BOD of the effluent? (10)

UNIT-IV

7) a) Explain the biochemical mechanism of the activated sludge process? Describe with sketches the treatment of sewage by activated sludge process? Mention the advantages and disadvantages of this system? (10)

b) An average operating data for conventional activated sludge treatment plant is as follows :

1) Waste water flow = 35000 m^3/d
2) Volume of aeration tank = 10900 m^3
3) Influent BOD = 250 mg/l
4) Effluent BOD = 20 mg/l
5) Mixed liquor suspended solids (MLSS) = 2500 mg/l
6) Effluent suspended solids = 30 mg/l
7) Waste sludge suspended soiids = 9700 mg/l
8) Quantity of waste sludge = 220 m^3/d

Based on the information given above, determine

a) Aeration period (hrs)

b) Food to microorganism ratio $\left(\frac{F}{M}\right)$ in (kg BOD per day per kg MLSS)

c) Percentage efficiency of BOD removal

d) Sludge age (days) 10

OR

8) a) Differentiate between the following pairs (10)

i) Step aeration and tapered aeration in activated sludge process.

ii) Oxidation pond and Oxidation ditch.

b) i) Design a septic tank for the following data (10)

No. of people = 100

Sewage | capita | day = 120 liters

De-sludging period = 1 year

Length to width ratio = 4 : 1

ii) What would be the size of its soak well if the effluent from this septic tank is to be discharged in it. Assume percolation rate through the soak well to be 1250 l/m^3/d

UNIT - V

9) a) Discuss in brief the biological and chemical methods of removal of phosphorous from wastewater? (10)

b) Explain the term "refuse" and give its composition and classification. Describe various methods employed for the collection and disposal of the refuse? (10)

OR

10) a) Explain the various methods to collect and dispose off (i) dry refuse (ii) sullage and (iii) Excremental waste in rural areas? (10)

b) What do you understand by "Sanitary land filling" and how it is practiced? Draw a neat sketch and explain the filling process adopted in such filling practices? (10)