BACHELOR OF TECHNOLOGY (F.T.B.E.) EXAMINATION, 2011

(2nd Year, 2nd Semester)

WASTE TREATMENT ENGINEERING

Time : Three Hours   Full Marks - 100

Use a separate Answer-Script for each Part

(50 marks for each Part)

Part - I

Attempt any **Three** questions

All questions carry equal marks.

1.   How are the characteristics of industrial waste water expressed? What is the importance of dissolved oxygen which is present in water? How does it help for the treatment of waste water? How the dissolved oxygen level is maintained in the stream, explain with the help of oxygen Sag curve.   16

2.   Answer any **two** :   2x8=16

   i)   State the function and importance of two stage anaerobic sludge digestion (High rate process) for production of Biogas.

   ii)   Discuss the phenomenon of discrete sitting of particles in primary treatment process.

   ii)   Discuss the working principle of Trickling filter which acts as attached growth biological reactor.

[Turn over

3. Write short notes (any **two**) 2x8=16

    i) Facultative logoon

    ii) Pure oxygen aeration process

    iii) Physical methods for separation of non-bio-degradable matter from waste water.

4. Discuss the relative merits and demerits of Batch and continuous processes for treatment of waste water. How will you proceed to formulate the design criteria for a continuous biological reactor. 16

5.   i) From the kinetic consideration establish the Mathematical Model for the BOD curve which is equivalent to destruction of organic matter by biological oxidation. Form the Rate equation in terms of organic matter concentration present in waste water as L, mg/l. 8

    ii) The data on oxygen utilisation are given below in BOD tests of waste water. Obtain the rate constant (k) and initial organic matter concentration (L_O) using the established B.O.D. equation. 8

has a value of 1.0. Calculate the volume of sludge before and after digestion if the inflow contains 1000 lb dry solid.

    3+2+11

9.   a) Draw a neat sketch of two stage anaerobic digestion process mentioning the dimensions.

    b) Determine the cft of methane produced from 1 lb glucose.

    c) For a sludge digestion system the following data are given. On that basis calculate the percentage stabilisation and the amount of gas produced. Rate of inflow is 10 mgd, dry solid in 1 mgd inflow is 1200 lb, BOD_2 removed from 1 mgd inflow is 1150 lb. The initial moisture is 95% and sp. gravity is 1.02, mean cell residence time is 10 days, efficiency of food utilisation is 80%. Growth yield coefficient is 0.05 and decay constant is 0.03 per day. 3+3+10

d) Determine the ThOD of an amino acid assuming CO_2 and Nitrate as end products.

e) Why do you examine 5-day BOD usually?   3+3+1+6+3

7. a) Draw a standard flow chart for waste water treatment operation.

b) With neat sketch show and explain the settling characteristics of particles at different zone during sedimentation operation with a sample of waste

c) Analyze an interface settling curve.

d) What is the basic difference between primary clarification and secondary clarification?   4+7+3+2

8. a) Calculate BOD_2 of one mole of microbial cell.

b) Mention the main operations and processes done to reduce water and organic content of sludge.

c) An waste treatment plant is required to digest a sludge in such a way that the moisture content is reduced to 90% from the initial value of 95%. The inflow of sludge initially contains 60% volatile matter in the solid portion and during digestion only 60% of the volatile matter is destroyed. The volatile matter has a specific gravity of 2.5 and fixed solid

t (days)	y (mg/l at BOD)
0	0.0
1	9.2
2	15.9
3	20.9
4	24.5
5	27.0
6	29.0
7	30.5

y being organic matter oxidised upto time t.

Part - II

Attempt any **Three** questions   3x16=48

General Proficiency — 2

6. a) Between BOD and COD, which one usually assumes higher value for a food plant. Justify your answer.

b) Name two food plants having high value of BOD mentioning the approx. range of the values.

c) What is the prescribed safe disposal limit of BOD?

[Turn over