ET-507(B)

B.Tech. Civil (Water Resources Engineering)

Term-End Examination

June, 2008

ET-507(B) : WASTE WATER TREATMENT

Time : 3 hours *Maximum Marks : 70*

Note : *Answer **six** questions in all. Question no. 1 is **compulsory**. Use of calculator is permitted.*

1. Choose the most appropriate alternative for each of the following : *10×1=10*

   (i) The waste water coming from kitchen and bathrooms is popularly known as

   (a) Storm discharge

   (b) Sullage discharge

   (c) Drainage discharge

   (d) None of these

(ii) With self-cleansing velocity in sewers

(a) silting occurs at the bottom

(b) scouring occurs at the bottom

(c) silting and scouring both occur at the bottom

(d) neither silting nor scouring occurs at the bottom

(iii) The gas which is generally found present in sewers is

(a) H_2S

(b) CO_2

(c) CH_4

(d) All of these

(iv) Biochemical Oxygen Demand (BOD) of sewage is

(a) oxygen required to oxidise biologically organic matter

(b) oxygen required to oxidise biologically inorganic matter

(c) Both (a) and (b)

(d) None of these

(v) The minimum D.O. prescribed for a river stream to avoid fish kills is

(a) 6 ppm

(b) 4 ppm

(c) 10 ppm

(d) 8 ppm

(vi) The detention period adopted for sewage sedimentation tank is of the order of

(a) 1 – 2 hours

(b) 5 – 10 minutes

(c) 4 – 8 hours

(d) 2 – 4 days

(vii) Activated sludge is the

(a) aerated sludge in the aeration unit

(b) sludge settled in humus tank

(c) sludge in the secondary tank after aeration and rich in microbial mass

(d) None of these

(viii) Sanitary land fills may cause troubles during

(a) peak summers

(b) peak winters

(c) peak monsoon

(d) None of these

(ix) If 10 ml of raw sewage is diluted to 250 ml, the dilution factor is

(a) 25

(b) 250

(c) 1/25

(d) 1/10

(x) The following unit operations exist in a sewage treatment plant :

1. Screening
2. Grit removal
3. Secondary sedimentation
4. Aeration
5. Primary sedimentation

The correct sequence of these operations is

(a) 1, 2, 3, 4, 5

(b) 1, 2, 5, 4, 3

(c) 2, 1, 4, 5, 3

(d) 2, 1, 4, 3, 5

2. (i) Name the important contaminants commonly found in domestic waste water and classify them. Briefly describe their sources and significance.

(ii) What do you understand by re-aeration of streams ? Deduce an equation for critical oxygen deficit in a stream receiving waste water discharge. 5+6=11

3. With the help of neat sketches explain the working of the following : 2x6=12

(i) Skimming tank

(ii) Dissolved air floatation unit

4. The average daily waste flow from a factory is 50 m^3 of stearic acid ($C_{17}H_{35}COOH$) of concentration 130 mg/l. Find out the following :

(i) Theoretical Oxygen Demand 5

(ii) BOD_5 3

(iii) Minimum nitrogen and phosphorus requirement in waste water for it to be amenable to biological oxidation. 4

(Assume Atomic weights H = 1, C = 12 & O = 16)

5. (i) What is sludge digestion ? How will you differentiate between aerobic and anaerobic sludge digestion ?

(ii) With the help of a line diagram, discuss the working of activated sludge process. 2×6=12

6. Discuss different types of treatment technologies available to make waste water re-usable. 12

7. (i) Discuss the importance of the following in the design of a sewer :

(a) Limiting velocity

(b) Self-cleansing velocity

(ii) Explain the Rational Formula for calculating the quantities of storm sewage in Indian catchments. 2×6=12

8. (i) Name the various criteria normally adopted in selecting sludge treatment/disposal option and elaborate any one of these. 9

(ii) Determine the number of 1·0 m diameter discs required in an RBC to treat waste water from a population of 3000 people assuming soluble BOD contribution of 0·05 kg/head.

9. Write short notes on any ***three*** of the following : 3×4=12

(i) Chemical Oxygen Demand

(ii) Pneumatic ejector

(iii) Manhole

(iv) Chemical aided sedimentation

(v) Leaching requirement

(vi) Principle of gas transfer