B.E. / B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS,
APRIL/MAY 2014

CIVIL ENGINEERING BRANCH

SIXTH SEMESTER

CE 9354 WASTEWATER ENGINEERING

(REGULATIONS: 2008)

Time: 3 hours   Answer All Questions   Max.Marks: 100

Instructions

(i)   Part A carries a maximum of 20 marks and Part B carries a maximum of 80 marks
(ii)   All questions in Part A carries 2 marks each and all question in Part B carries 16 marks each
(iii)   Make suitable assumptions wherever necessary and state them clearly.

PART A (10X2 = 20 Marks)

1.   Enumerate the impacts of thermal pollutants on water bodies.

2.   Bring out the difference between BOD and COD.

3.   How does crown corrosion occur in sewer?

4.   Why are sanitary sewers designed for partial flow condition?

5.   List out the operational issues pertaining to grit chamber.

6.   What are the benefits of grey water harvesting?

7.   Write down the equation for growth rate at endogenous phase of respiration.

8.   Distinguish between anoxic and anaerobic process.

9.   What is the significance of pH in anaerobic digestion?

10. A town discharges 80 m^3/s of treated sewage into a stream having a rate of flow
     1200 m^3/s. The DO content of treated sewage is 0.5 mg/L. The DO concentration in
     the upstream side of the stream is 8.0 mg/L. Find the DO of mix.

PART B (5X16 = 80 Marks)

11.i)   Explain the various sources of wastewater and also discuss the physico-chemical
        characteristics of wastewater.   (12)

   ii) The BOD_5 at 27°C of wastewater sample has been measured as 480 mg/L. What
        would be the 7th and 10th day BOD at 20°C? Assume the reaction rate constant at
        20°C as 0.21 d^{-1} (4)

12.a)   State the principles you would observe while preparing drainage plan of a building.
        Also explain various systems of sanitary plumbing.

(OR)

12.b)   Design an inverted siphon to carry sewage across a canal. The total length of the siphon measured along the centre line including slope is 75 m. The invert levels at the inlet and outlet ends of the sewer are 124.45 m and 123.70 m respectively. The average sewage flow is 0.165 m^3/s, the maximum and minimum flows are 300 % and 40 % of the average flow respectively. Assume the minor losses as 100 mm.

13.a)   Design a screen chamber and grit channel for a proposed sewage treatment plant of 45 ML/d capacity. Assume suitable criteria as applicable.

(OR)

b)   Design a septic tank with neat sketch for a hostel having 175 students. Design sewage flow is 70 Lpcd. Desludging period is one year. What would be the size of the dispersion trench, if the effluent from the septic tank is to be discharged in it?

14.a)   Briefly describe the classification of trickling filters. Explain the mechanism of biofilm formation and mass transfer in a tricking filter process with a neat sketch.

(OR)

b)   Draw a process layout of a conventional ASP plant for domestic sewage treatment. Also, discuss the various operational parameters influencing the system.

15.a)   *Explain the various transport phenomena which occur during self purification of rivers and the various stages of oxygen sag curve.*

(OR)

b)   The thickened sludge of 100 m^3/d is processed in a standard rate anaerobic digester. The moisture content of thickened sludge is 95%. The digestion period is 25 days and the sludge must be stored for 3 months between final disposal events during monsoon period. Organic content of the sludge is 70 percent and 60 percent of the organics are converted into gaseous and liquid end products The solid content of the digested sludge is 4.5%. Determine the required reactor volume. Assuming 100 $kg/m^2/yr$ solids loading rate, design the number of sludge drying beds required for dewatering operation.

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