B. Tech. 6th Semester (Civil Engg.) Examination,

May–2012

SEWERAGE & SEWAGE TREATMENT

Paper–CE-308–F

Time allowed : 3 hours]   [*Maximum marks : 100*

Note :   (i)   *Attempt five questions in all.*

      (ii)   **Question No. 1 is compulsory** *and solve one question from each section.*

     (iii)   *Draw neat diagrams and drawings with designs.*

     (iv)   *All questions carry equal marks.*

     (v)   *Assume suitable data if missing and wheresoever's necessary.*

1.   (i)   Differentiate between the following :

     (a)   Advantages of circular sewers over other forms of sewer sections.

     (b)   Clean out and street inlet in sewer appurtenant.

     (c)   BOD and COD

     (d)   Primary settling tank and secondary settling tank

     (e)   Define waste water reuse and waste water recycling.

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(ii) Describe the following statements :

(f) What are the sources of air pollutions ?

(g) How can you minimize emissions that contribute to acid rain ?

(h) Characteristics of fresh water are not similar to that of septic sewage.

(i) Variations in sewage flow are necessarily considered in the design of sewers and treatment plants.

(j) Some appurtenances are compulsory whereas some others are obsolete over sewers.   10×2=20

Section–A

2. (i) Tabulate difference between conservancy and water carriage system of sanitation.   5

(ii) What is dry weather flow ? How is it estimated ?

5

(iii) Calculate the diameter and discharge of a circular sewer laid at a slope of 1 in 300 when it is running half full and with a velocity of 2.5m/sec. (take n = 0.015) Use Manning's formula.   10

3. (i)   Name various sewer appurtenances and explain automate flushing tank in detail with neat sketch.   5

(ii) Name various characteristics of sewage and discuss significance of temperature in detail. 5

(iii) Design a sanitary sewer with following data

1. Population   = 50000 Persons

2. Expected Sewer flow (average) =   200 LPCD

3. Average slope of ground   =   1 in 800

                                                                10

Section–B

4. (i)   Differentiate between sludge digestion tank and septic tank.

(ii) Design a SDB for digested sludge obtained from low rate anaerobic digesters for degesting a mixture of primary and excess activated sludge the capacity of ASP is 50000m3/d and following data is assumed

(1) Volume of digested sludge   = 229 cum per day

(2) Dewatering drying and sludge removal cycle = 10d

(3) Depth of application of sludge   = 0.3m

                                                              10+10=20

5. (i) Design an up flow sludge blanket reactor for an average flow of 5 MLD of wastewater with the following data :

(1) COD of wastewater = 400 Mg/liter

(2) Design hydraulic residence time = 6 hours

(3) Design COD loading = 1-2kg COD/m3d

(4) Velocity of rise of wastewater in the reactor through sludge bed = 0.75m/hour

(5) Velocity of wastewater in setting chamber = or < 1.5m/hour

(6) Flow area covered by each inlet = 1-2m2

10

(ii) What do you understand by Self Purification of Streams ? Explain in detail. 10

Section–C

6. (i) Design secondary sedimentation tank to treat effluent from actuated sludge plant with following design data

Ave. waste water flow = 50 m/d

MLSS conc. in effluent $\quad = 3000$ mg/lit

Peak load factor $\quad\quad\quad = 2.25$

10

(ii) Design an anaerobic filter to treat an average flow of 5 MLD of waste water with the following assumption :

COD of waste water $\quad = 400$mg/liter

Design COD loading $\quad = 1.0$kg COD/m3 d

Depth of media $\quad\quad = 1.2$ meter

10

7. (i) Design a facultative aerated lagoon to serve 40000 people. Sewage flow @ 180 LPCD = 7200 cum/day. Raw $BOD_5 = 50$ gcd or 277mg/1 and final BOD_5 is not to exceed 30 mg/1 in water average ambient air temperature in January is 18 deg. C and in Summer 37deg.C. $\quad$ 10

(ii) Design a facultative stabilization pond to treat 5000 m3/d municipal wastewater, BOD_5 230 mg/1, from a town (Population 25000 persons) located in central India, latitude is 22 degree.N; Elevation is 100 metre above sea level.

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The average temperature in January is 18 degree C. The effluent from the pond is to be used for Irrigation. 　　　10

Section–D

8. (i) How can you minimize emissions that contribute to acid rain ?

(ii) What are the sources of air pollution ?

(iii) What are the main classes of air pollution ?

(iv) What are the noise standards for occupational health and safety ?

(v) What is the noise pollution ? What are the effects of noise pollution and explain various methods to reduce the noise pollution ?

(vi) Differentiate between Ln, Leq and Ldn in relation to expression of sound levels.

(vii) Differentiate between continuous noise, intermittent noise and impulse noise.

(viii) How does air pollution affects the different zones of the atmosphere ?

(ix) Difference between RSPM and TSPM in relation to the air pollution.

(x) How does air pollution affects humans health ?

(xi) How do winds impact dispersion of pollutions into the ambient air environment. What is double inversion ?   10×2=20

9. (i) Briefly explain the types, sources and control of air pollution.

(ii) What are the characteristics of sound and its measurements ?

(iii) What is level of noise for a normal human being?

(iv) Differentiate between sound pressure and sound intensity.

(v) How does ELR and ALR affect dispersion of an air pollutant into the atmosphere ? Draw various possible behaviours of the emitted plume.

(vi) How does the existing atmospheric pressure and moisture prevalent in the atmosphere affect the dispersion of air pollutants into the ambient air atmosphere.

(vii) Enumerate and describe the various natural properties which clean the ambient air over time by removing the various air pollutants.   20