

**24381**

**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.

**24381-980-P-7-Q-9-(12)**

**P.T.O.**

(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 50000m<sup>3</sup>/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/m <sup>3</sup> d |
| (4) Velocity of rise of wastewater in the reactor through sludge bed | = | 0.75m/hour                 |
| (5) Velocity of wastewater in settling chamber                       | = | or < 1.5m/hour             |
| (6) Flow area covered by each inlet                                  | = | 1-2m <sup>2</sup>          |

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<sup>3</sup>/d

MLSS conc. in effluent = 3000 mg/lit

Peak load factor = 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 = 400mg/liter

Design COD loading = 1.0kg COD/m<sup>3</sup> d

Depth of media = 1.2 meter

10

7. (i) Design a facultative aerated lagoon to serve 40000 people. Sewage flow @ 180 LPCD = 7200 cum/day. Raw BOD<sub>5</sub> = 50 gcd or 277mg/l and final BOD<sub>5</sub> is not to exceed 30 mg/l in water average ambient air temperature in January is 18 deg. C and in Summer 37deg.C. 10

- (ii) Design a facultative stabilization pond to treat 5000 m<sup>3</sup>/d municipal wastewater, BOD<sub>5</sub> 230 mg/l, from a town (Population 25000 persons) located in central India, latitude is 22 degree.N; Elevation is 100 metre above sea level.

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  $L_n$ ,  $L_{eq}$  and  $L_{dn}$  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 ?  $10 \times 2 = 20$

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