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ET-507(B)

B.Tech. Civil (Water Resources Engineering)

Term-End Examination

December, 2011

01122

ET-507(B) : WASTE WATER TREATMENT

Time : 3 hours *Maximum Marks : 70*

Note : *Answer **six** questions in **all**. Question number **1** is **compulsory**. Use of scientific calculator is permitted. The answers must be in your own language.*

1. Select the correct answer from the four options in each of the following : **10x1=10**

(a) The sewer which transport the sewage to the point of treatment is called :

(i) house sewer (ii) main sewer

(iii) out fall sewer (iv) none of these

(b) The coefficient of runoff for completely impervious areas tend to :

(i) zero (ii) 0.5

(iii) 1.0 (iv) infinity

(c) 'Crowe' is provided at :

(i) lower end of ventilating column

(ii) upper end of ventilating column

(iii) upper end of manhole

(iv) first step in manhole

(d) The gas which is generally present in sewers, is :

(i) H_2S (ii) CO_2

(iii) CH_4 (iv) All of these

(e) Minimum 0.0 prescribed for a river stream, to avoid fish death is :

(i) 2 ppm (ii) 4 ppm

(iii) 8 ppm (iv) 10 ppm

(f) For a grit chamber, if the velocity of flow is 0.25 m/sec and detention period is 2 minutes, the length of tank, will be :

(i) 16 m (ii) 20 m

(iii) 24 m (iv) 30 m

(g) Lower F/M value in a conventional activated treatment plant will mean :

(i) Lower BOD Removal

(ii) Higher BOD Removal

(iii) NO effect on BOD Removal

(iv) None of the above

(h) If a factory produces an average of 300 m^3/d of waste water. Assuming that sewage flow is 100 lit/d, the Hydraulic equivalent population is :

(i) 1000 (ii) 3000

(iii) 100 (iv) 300

(i) In a sludge digestion tank, the moisture content of sludge of volume V_1 litre is reduced from P_1% to P_2%. The resulting volume will be :

(i) $\frac{(100 + P_1)}{(100 + P_2)} \times V_1$

(ii) $\frac{(100 - P_1)}{(100 + P_1)} \times V_1$

(iii) $\frac{(100 - P_1)}{(100 - P_2)} \times V_1$

(iv) $\frac{(100 + P_2)}{(100 - P_1)} \times V_1$

(j) A conventional activated sludge plant involves a misery regime, which is essentially of :

(i) Plug flow tape

(ii) Completely mixed tape

(iii) Both (i) and (ii)

(iv) None of these

2. (a) What is a Trap ? With the help of neat sketch describe the working of Increpting Trap ? 5

(b) A certain low - lying area has a population of 4000 persons, who are being supplied water at the rate of 135 lit per day. Design an air - ejector as a composite unit for the area. Assume following : 7

(i) Velocity of compressed air = 6 m/sec

(ii) Velocity in the main sewer = 0.9 m/sec

(iii) Time required to fill ejector = 10 minutes

(iv) height of ejector = 2.0 m

(v) entire water that is supplied appears as sewage.

3. (a) Discuss the principle of Gas Transfer ? 6

(b) Design a grit chamber to remove the particles of 0.2 mm diameter and specific gravity 2.6. Settling velocity of the particles are in the range of 0.014 to .022 m/sec. The proportioning weir will be having a velocity of 0.27 m/sec. The maximum waste water flow is expected to be 13000 m^3/day. 6

4. (a) Differentiate between aerobic and anaerobic forms of biological reactions. 5

(b) The 5 day BOD at 30°C of a sewage sample is 110 mg/lit. Calculate its 5 day BOD at 20°C . Assume Deoxygenation constant at 20°C (K_{20}) as 0.1. 7

5. (a) Define Sludge Volume Index ? What is it's importance in sewage treatment. 4

(b) With the help of line diagram, describe the treatment of sewage using single stage bio-filter. What are the common operational problems associated with the conventional media biological filters ? 8

6. (a) List the seven criteria, which are generally considered in selecting a sludge treatment/ disposal option and elaborate any one of them in detail. 6

(b) Design an oxidation pond for treating sewage from a hot climatic residential colony with 5000 persons, contributing sewage @ 120 lit/capita/day. The 5 - day BOD of sewage is 300 mg/lit. 6

7. Discuss system approach to the problem of re-use of waste water in detail. 12

8. (a) Spreading basins are better than direct injection well system. Discuss. 6

(b) With the help of neat sketch describe the working of Rotating Biological Contractors (RBC). 6

9. Write short notes on ***any four*** of the following : **4x3=12**

(a) Conservative pollutants

(b) Limiting velocity

(c) Anaerobic pond

(d) Incineration

(e) Sludge Bulking

(f) Cleaning of Deep Bed filters