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ET-507(B)

B.Tech. Civil (Water Resources Engineering)

Term-End Examination

00524

December, 2017

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 calculator is permitted.*

1. (a) The sewerage system originates from

(i) house sewer

(ii) lateral sewer

(iii) branch sewer

(iv) main sewer

(b) Cowl is provided at the

(i) lower end of the ventilating column

(ii) upper end of the ventilating column

(iii) upper end of the manhole

(iv) first step in the manhole

(c) Facultative bacteria survives in

(i) the presence of oxygen

(ii) the absence of oxygen

(iii) Both cases (i) and (ii)

(iv) Neither (i) nor (ii)

(d) In sewers, the velocity of flow should ***not*** be

(i) more than the self-cleaning velocity

(ii) less than the self-cleaning velocity

(iii) less than 10 m/sec

(iv) more than 20 m/sec

(e) Manholes are generally located at

(i) all changes of direction of sewer

(ii) all changes of gradient of sewer

(iii) all junctions of different sewers

(iv) All of the above

(f) Acidity of sewage is indicated by pH value of

(i) less than 7

(ii) more than 7

(iii) equal to 7

(iv) equal to 14

(g) Minimum D.O. prescribed for a river stream to avoid fish killing, is

(i) 2 ppm

(ii) 4 ppm

(iii) 8 ppm

(iv) 10 ppm

(h) When there is no recirculation of treated sewage in high rate biological filtration of sewage, then the recirculation factor is

(i) 1

(ii) 0

(iii) infinity

(iv) None of these

(i) 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) lower D.O. removal

(j) Which of the following pairs is ***not*** correctly matched ?

(i) BOD — Strength of sewage

(ii) Methane — Product of anaerobic decomposition

(iii) COD — Biodegradability of wastewater

(iv) Nitrate — Methemoglobinemia *10×1=10*

2. (a) List the various types of solids present in wastewater. How would you determine the amount of suspended and settleable solids present in wastewater ? *6*

(b) What are the basic components of a sewer system ? Discuss the importance of Self-Cleaning and Limiting Velocity in the design of a sewer. *6*

3. (a) What is Biochemical Oxygen Demand (BOD) ? With the help of a typical BOD curve, distinguish between first stage BOD and second stage BOD. *7*

(b) In an aerial photographic survey of a 15·5-ha catchment, the following area classification was determined :

(i) Flat densely wooded = 6·6 ha, C = 0·01

(ii) Lawn = 6·2 ha; C = 0·19

(iii) Paved roadway = 2·7 ha; C = 0·93

Compute the composite runoff coefficient (K) for the total area of catchment. *5*

4. (a) Draw a neat sketch of a sewage ventilator and explain the necessity of sewage ventilation. *6*

(b) Why is chemical aided sedimentation not so common in case of wastewater treatment ? Discuss the properties of two coagulants used in sewage treatment. *6*

5. (a) Differentiate between attached growth process and dispersed growth process. List the various treatment technologies falling under both the processes. *5*

(b) A town of 20,000 population is to discharge treated domestic sewage to a stream with a minimum flow of 0·127 m^3/sec and BOD 2 mg/lit. The sewage dry weather flow is 135 lit/person/day and per capita BOD contribution is 0·068 kg/day. If the BOD in the stream just below the discharge is not to exceed 4 mg/lit, calculate

(i) the maximum permissible effluent BOD, and

(ii) the percentage purification required in the proposed treatment plant. *7*

6. (a) What do you understand by digestion of sewage sludge ? Give a neat sketch of an anaerobic sludge digester and explain its working. *8*

(b) Define Sludge Volume Index (SVI). What is its importance in sewage treatment ? *4*

7. (a) With the help of a flow diagram, describe the process of composting for the final disposal of sludge. What are the advantages and disadvantages of the static pile system of composting ? *7*

(b) Dewatering of sludge is necessary before its ultimate disposal. Discuss in detail. *5*

8. Discuss in detail, the approaches used for the re-use of wastewater. *12*

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

   (a) Gully Trap

   (b) Crown Corrosion

   (c) Adsorption

   (d) Depth-Duration Curve

   (e) Eutrophication

   (f) Cleaning of Deep Bed Filters