$\boxed{\text{ET-507(B)}}$

B.Tech. Civil (Water Resources Engineering)

Term-End Examination

⊓⊓2⊟2   **June, 2018**

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 sewer design should be checked for

    (i) Only maximum flow

    (ii) Only minimum flow

    (iii) Both maximum and minimum flow

    (iv) None of these

    (b) The detention period adopted for a sewage sedimentation tank is of the order of

    (i) 1 – 2 hours

    (ii) 4 – 8 hours

    (iii) 8 – 16 hours

    (iv) 24 – 36 hours

(c) The gas which is generally present in sewers is

(i) H_2S

(ii) CO_2

(iii) CH_4

(iv) All of these

(d) The wastewater with pH = 3 will be more acidic as compared to wastewater with pH = 5 by

(i) 2 times

(ii) 20 times

(iii) 100 times

(iv) None of these

(e) Between BOD and COD, the greater of the two is

(i) BOD

(ii) COD

(iii) Both are equal

(iv) Depends on sewage characteristics

(f) If the recirculation ratio in a high rate trickling filter is unity, then the recirculation factor is

(i) 1

(ii) More than 1

(iii) Less than 1

(iv) Zero

(g) High COD to BOD ratio in an organic pollutant represents

(i) High biodegradability of the pollutant

(ii) Low biodegradability of the pollutant

(iii) Presence of free oxygen for aerobic reaction

(iv) Presence of toxic material in the pollutant

(h) Waste stabilisation ponds can be

(i) Aerobic

(ii) Anaerobic

(iii) Facultative

(iv) Any of these

(i) The secondary treatment of sewage removes

    (i) Suspended organic matter

    (ii) Dissolved and colloidal organic matter

    (iii) Harmful bacteria

    (iv) Fats and grease

(j) In the design of storm sewers, 'time of concentration' is used to determine the

    (i) Rainfall intensity

    (ii) Velocity in the sewer

    (iii) Time of travel

    (iv) Area served by the sewer   *10×1=10*

2. (a) What do you understand by 'time of concentration'. Discuss its significance in the estimation of storm water flow.   *6*

(b) The BOD_5 of wastewater is determined to be 200 mg/lit at 20° C. The K is known to be 0·23 per day. What would be the BOD_5 if the test was conducted at 15° C ?   *6*

3. (a) What are manholes ? Describe their uses. 6

(b) What do you understand by physical unit operation ? Enlist the applications of various physical unit operations employed in wastewater treatment along with their significance. 6

4. (a) With the aid of neat sketch describe the working of a Grit Chamber. 6

(b) Discuss the various aerobic and anaerobic forms of biological stabilisation reactions. 6

5. (a) With the aid of suitable diagram, describe the working of Biological Aerated Filters (BAF). 6

(b) Define algae-bacteria symbiosis. How has this concept been used in the treatment of wastewater ? 6

6. (a) With the help of a flow diagram describe the treatment of sewage by 'conventional activated sludge process'. Mention the advantages and disadvantages of the system. 8

(b) An activated sludge plant treating a flow of 25 lit/sec has an aerated basin volume of 450 m^3 and operates with MLVSS concentration of 3250 mg/lit. Sludge with a VSS content of 15000 mg/lit is wasted at a rate of 35 m^3/d. Calculate the 'sludge age' and 'hydraulic retention time'.   *4*

7. (a) What are the objectives of 'sludge thickening' ? Using a neat shetch, describe the working of 'air floatation thickness'.   *8*

(b) The moisture content of sludge is reduced from 95% to 85%. Show that its volume is reduced to one-third of the original volume during this process.   *4*

8. (a) What are the relative advantages and disadvantages of using wastewater for irrigation purposes ?   *5*

(b) Regular monitoring and evaluation of wastewater re-use projects is necessary. Discuss.   *7*

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

    (a)   Testing of sewer

    (b)   Sewer rehabilitation

    (c)   Bio-towers

    (d)   Screens

    (e)   Anaerobic digestion

    (f)   Lagoons

    (g)   Junction chambers

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