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ET-507(B)

B.Tech. Civil (Water Resources Engineering)

Term-End Examination

December, 2014

00440

ET-507(B) : WASTE WATER TREATMENT

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **six** questions in all. Question No. **1** is **compulsory**. Use of calculator is permitted.*

1. Choose the correct answer from the given choices : *10×1=10*

(a) The sewerage system originates from *1*

(i) house sewer

(ii) outfall sewer

(iii) branch sewer

(iv) lateral sewer

(b) The sewer pipes have to be designed and checked for *1*

(i) only maximum flow

(ii) only minimum flow

(iii) both maximum and minimum flow

(iv) None of these

(c) The value of coefficient of run-off for perfectly impervious areas tend to *1*

(i) zero

(ii) 0·5

(iii) 1·0

(iv) 10

(d) The drop manholes are provided in sewers in *1*

(i) industrial areas

(ii) large townships

(iii) hilly townships

(iv) cities in plains

(e) Testing of sewer pipes may involve *1*

(i) water test

(ii) mirror test

(iii) ball test

(iv) All of these

(f) In a ventilating column, a cowl is provided *1*

(i) to prevent entry of foul gases

(ii) to prevent entry of objects

(iii) to prevent the exit of heat

(iv) None of these

(g) The standard B.O.D. of water is taken for *1*

(i) 1 day

(ii) 5 days

(iii) 10 days

(iv) 20 days

(h) The primary treatment of sewage consists of *1*

(i) Removal of large suspended organic solids

(ii) Removal of air and grease

(iii) Removal of sand and silt

(iv) None of the above

(i) The moisture content of sludge is reduced from 90% to 80% in the sludge digestion tank. The percentage decrease in the volume of sludge is *1*

(i) 25%

(ii) 50%

(iii) 10%

(iv) 5%

(j) Lower F/M value in conventional activated sludge treatment plant will mean *1*

(i) Lower BOD removal

(ii) Higher BOD removal

(iii) No effect on BOD removal

(iv) Higher Grit removal

2. (a) What is the significance of dissolved oxygen in wastewater treatment ? Also deduce the Dissolved Oxygen (DO) sag formula for dissolved oxygen concentration in water course receiving an oxygen consuming wastewater discharge. *7*

(b) Discuss the methods to determine number of coliform bacteria present in wastewater. *5*

3. (a) What are Manholes ? With the help of a neat sketch, describe the components of a typical drop manhole. *6*

(b) An ejector has to lift 2250 litres of sewage per minute. If the velocity of main sewer is 0·75 m/sec and the velocity of compressed air is 6 m/sec, design the ejector. Assume that ejector is filled and emptied 10 times an hour. *6*

4. (a) Discuss why chemical aided sedimentation is not so common in the case of wastewater treatment. Also describe the properties of two common coagulants in the sewage treatment. *6*

(b) Distinguish between aerobic oxidation and anaerobic decomposition process. *6*

5. It is intended to treat 2000 m^3/day of domestic sewage from a population of 10,000 people so that 95% of the BOD is removed in a biological reactor. If ultimate BOD of sewage is 300 mg/litre and reaction constant K is 0·23/day (base e) calculate *12*

(a) the BOD of the sewage

(b) daily per capita BOD contribution

(c) the volume of plug flow reactor required

(c) the volume of completely mixed reactor required.

6. (a) With the help of a suitable diagram, explain the basic operations involved in conventional activated sludge process. *6*

(b) A college has a population of 500 and is provided with flush toilets. The water consumption is 70 litres/person/day and BOD contribution is 0·5 kg/person/day. If minimum mean monthly air temperature is 18°C, determine a suitable size for an oxidation pond to treat the wastewater from the college. *6*

7. (a) Do you agree that the characteristics and quality of sludge produced can vary seasonly or even daily ? Discuss. Also describe the various stages that are involved in the sludge processing. *7*

(b) What is meant by the term 'Dewatering of sludge' and why is it considered necessary ? *5*

8. Monitoring and evaluation of wastewater reuse project is necessary. Discuss in detail. *12*

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

(i) Hydrograph

(ii) Bacteria – Alage Symbiosis

(iii) Testing of House Sewer

(iv) Chemical Oxygen Demand

(v) Sludge Bulking

(vi) Rotating Biological Contractor (RBC)