

**B.Tech. Civil (Water Resources
Engineering)**

00154

Term-End Examination

June, 2010

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. Choose the most appropriate alternative for each of the following : **10x1=10**
- (a) pH=3, when compared to pH=5, will be more acidic by :
- (i) 2 times (ii) 20 times
(iii) 100 times (iv) none of them
- (b) For rural areas, most suitable solid waste disposal method is :
- (i) Pyrolysis (ii) Incineration
(iii) Land filling (iv) Composting
- (c) Under natural conditions of flow, an unpolluted river would contain :
- (i) More dissolved oxygen in summer than in winter.
(ii) Less dissolved oxygen in summer than in winter :
(iii) More or less the same amount of dissolved oxygen in winter and summer

- (iv) The least amount of dissolved oxygen during the floods.
- (d) The following reactions take place during anaerobic digestion of organics
- (1) Methane production
 - (2) Alkaline fermentation
 - (3) Acid fermentation
 - (4) Acid regression
- The correct sequence of these reactions is :
- (i) 3, 4, 2, 1 (ii) 4, 3, 2, 1
- (iii) 3, 4, 1, 2 (iv) 4, 3, 1, 2
- (e) Various unit operations exist in a sewage treatment plant. These would include :
- (1) screening
 - (2) grit removal
 - (3) secondary sedimentation
 - (4) aeration
 - (5) primary sedimentation
- The correct sequence of these operation is :
- (i) 1, 2, 3, 4, 5 (ii) 1, 2, 5, 4, 3
- (iii) 2, 1, 4, 5, 3 (iv) 2, 1, 4, 3, 5
- (f) Pumping storm water is usually done by employing
- (i) Submergible pump
 - (ii) Centrifugal pump
 - (iii) Axial flow pump
 - (iv) Turbine pump
- (g) The formulation for BOD assimilation in a stream should include :
- (i) BOD rate constant
 - (ii) Sedimentation of organic matter

- (iii) BOD rate constant and sedimentation of organic matter
- (iv) Pathogenic bacterial decay constant
- (h) Non-disposal of solid waste may cause the spread of :
 - (i) malaria
 - (ii) rodent related plague
 - (iii) typhoid
 - (iv) dysentery
- (i) Which one of the following would help to prevent the escape of foul sewer gases from a water closet ?
 - (i) Air Gap
 - (ii) Vent pipe
 - (iii) Gulley trap
 - (iv) None of the above
- (j) Corrosion in sewer occurs due to :
 - (i) Methane
 - (ii) Carbon dioxide
 - (iii) Carbon monoxide
 - (iv) Hydrogen sulphide

2. (a) What is the necessity of maintaining constant velocity in grit channel ? **2x6=12**
- (b) BOD (Bio chemical oxygen demand at 20°C after 5 days) of a sewage sample has been found to be 250 mg/l. What is its value on the 15th day at 25°C ? Assume $K_{20^\circ} = 0.12$.

3. (a) Draw the flow diagrams of the following methods of sewage treatment plants and label its various parts : 2x6=12
- (i) Primary sedimentation
 - (ii) Trickling filters, and
 - (iii) Chemical treatment
- (b) A dairy processing 1,13,000 kg of milk daily produces an average of 246 cum per day of wastewater with a BOD of 1400 mg/litre. Compute
- (i) The waste water flow per 1000 kg of milk received.
 - (ii) BOD per 1000 kg of milk received.
4. (a) Explain the principle and operation of an oxidation pond. List its merits and demerits.
- (b) Give the flow diagram for 'the activated sludge process', and describe the working of the activated sludge plant. 2x6=12
5. (a) Draw a flow diagram of a sewage treatment plant for a medium sized town. 2x6=12
- (b) What are the specific risks involved in reusing wastewater for potable purposes in our country ?
6. (a) Enumerate the advantages and disadvantages of using waste water for irrigation. 2x6=12
- (b) A 2% solution of a sewage sample is incubated for 5 days at 20°C. The depletion of oxygen was found to be 4 ppm. Determine the BOD of the sewage.

7. (a) State whether the following statements are true or false 2x6=12
- (i) Whenever two sewer meet at one point, main sewer is the smaller than the in coming sewer
 - (ii) In general, sewer does not slope in the same direction in which ground surface slopes.
 - (iii) Manholes are generally located at all points where sewer transition occurs.
 - (iv) The vertical scale adopted in plotting of sewer profile is usually 10 times the horizontal.
 - (v) If a sewer changes direction in manhole without change in size, a drop of 30 mm is usually provided.
 - (vi) If a sewer changes size, the crowns of inlet and outlet sewers should not have same elevation.
- (b) There is a dry weather flow of 600 litre/sec. Assuming flow velocity through the tank as 0.30 m/sec and detention period of 3.0 minutes, design a suitable grit chamber-cum-detritus tank. The maximum flow is three times the dry weather flow.
8. (a) Mention the common types of organisms found in domestic sewages, and explain why routine biological examination of sewage is usually not carried out, as is done for water supplies. 2x6=12

- (b) Design an oxidation pond for treating sewage from a hot climatic residential colony with 6000 persons contributing @ 120 litres per capita per day. The 5 - day BOD of sewage is 280 mg/l.

9. Write short notes on *any four* of the following :

- (a) Contact Beds **4x3=12**
(b) Imhoff tanks
(c) Disposal of radioactive waste
(d) Nitrogenous oxygen demand
(e) Lagoons
(f) Manhole
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