Total No. of printed pages = 6

CE 131702

Roll No. of candidate | | | | | | | | | | |

2017

B.Tech. 7th Semester End-Term Examination

Civil

ENVIRONMENTAL ENGINEERING — II

Full Marks – 100 Time – Three hours

Answer Question No. 1 and any *six* from the rest.

The figures in the margin indicate full marks for the questions.

$(10 \times 1 = 10)$

1. (a) The water of a river has an important property called

   (i) Turbidity

   (ii) Self purification

   (iii) Permeability

   (iv) Infiltration capacity

   (b) Sullage/rubbish ———— is a term used to indicate the waste water from bath rooms, kitchens, washing places and wash basins etc.

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(c) Egg shaped sewers are generally used for

(i) Separate system

(ii) Combined system

(iii) Partially separate system

(iv) All of these

(d) The lower portion of a manhole is known as

(i) Access shaft

(ii) Base

(iii) Working chamber

(iv) Cover

(e) A drop manhole is provided if

(i) A sewer drops from a height

(ii) A branch sewer discharges into main sewer at a higher level

(iii) Both (i) and (ii)

(iv) None of these

(f) Air vent pipe is not essentially required in a septic tank.

(i) True

(ii) False

(g) Biochemical oxygen demand (B.O.D) of safe drinking water must be

(i) 0

(ii) 10

(iii) 50

(iv) 100

(h) Which of the statement is correct?

(i) Sewage, if not treated, will create healthy conditions

(ii) Secondary treatment of sewage works on hydraulic separation principle

(iii) Primary clarifiers are the sedimentation tanks located just after the grit chambers

(iv) Trickling filter is different from percolating filter

(i) The activated sludge process of sewage treatment

(i) Requires smaller area for construction of whole unit

(ii) Requires smaller water head for operation than trickling filters

(iii) Has high efficiency

(iv) All of the above

(j) A good trap should

(i) Not have self cleansing property

(ii) Provide an adequate water seal at all times

(iii) Restrict the flow of water

(iv) All of these

2. (a) What do you mean by sanitation? How does a house sewer differ from a main sewer? (4)

(b) What are different methods of sewage collection? Under what situations, a separate system of sewerage is generally adopted? (5)

(c) State the merits and demerits of : (6)

(i) Separate system

(ii) Combined system of sewerage.

3. (a) Calculate the velocity of flow and corresponding discharge in a sewer of circular section having diameter of 1 m laid at a gradient of 1 in 600. The sewer runs at 0.6 depths. Use Manning's formula, taking $n = 0.012$. (6)

(b) Briefly describe the general considerations in the design of sewers. (5)

(c) Draw a neat sketch of a Standard Egg shaped sewer. (4)

4. (a) What are main problems in sewer maintenance? Mention any two precautions to be observed while entering a manhole. (5)

(b) Define time of concentration. A district having an area of 20 hectares with coefficient of relative impermeability as 0.75, has to be drained by a sewer of 900 metres length, laid at a gradient of 1 in 300. The rainfall intensity may be assumed to be of 10 to 20 minutes and the time of entry at the sewer inlet as 3 minutes. Design the storm water sewer. (2 + 8 = 10)

5. (a) What are the objectives of sewage analysis? (3)

(b) What is biochemical oxygen demand? Explain the oxidation process taking place in a wastewater with the help of BOD curve. (5)

(c) The 5-day BOD at 20°C of a waste water is found to be 200 mg/l. Estimate the ultimate BOD if reaction constant, $k = 0.15$ days^{-1}. What will be the 8-day BOD value at 15°C? (7)

6. (a) Where are manholes, street inlets and flushing tanks usually located? (3)

(b) What do you understand by storm relief works or storm regulators? Explain with a neat sketch, the working of any one type of storm regulator. (5)

(c) An ejector for a district of 5000 persons with a supply of 135 litres per head per day is required to lift the sewage. The system of sewage is separate and there is no infiltration of water. Assuming a velocity of 0.9 m/sec in the mains, ejector filling time of 5 minutes and velocity of compressed air 6 m/sec, design the ejector. (7)

7. (a) Discuss disposal of sewage by (i) Dilution (ii) Irrigation. (10)

(b) Explain the various actions involved in the self purification of running streams. (5)

8. (a) Differentiate between Activated Sludge Process and Trickling Filters based on comparative characteristics. (8)

(b) A rectangular sedimentation basin is to be designed for a flow of 4.5 million litres daily (mld) using a 2:1 length to width ratio, an overflow rate of 2.3×10^{-4} m/sec. and a detention period of 3 hours. What are the dimensions of the basin? (7)

9. (a) Define sludge. What are the three stages of biological action in the process of sludge digestion? (2)

(b) What are stabilization ponds? Mention the different types of stabilization ponds. (3)

(c) Differentiate between : (2)

(i) residual head and available head

(ii) water main and service pipe.

(d) Design a septic tank for a small colony of 100 persons with daily sewage flow of 150 litres per head per day. Assume any data necessary. (8)
