Question Paper Code : X 20314

B.E./B.Tech. DEGREE EXAMINATIONS, NOV./DEC. 2020

Sixth Semester

Civil Engineering

CE 6605 – ENVIRONMENTAL ENGINEERING – II

(Regulations 2013)

[Common to PTCE 6605 – Environmental Engineering II for B.E. (Part-Time)
– Fifth Semester – Civil Engineering – Regulations 2014)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A (10×2=20 Marks)

1. State the sources of wastewater.

2. What is meant by time of concentration ?

3. What are small bore systems ?

4. Why are sewers circular ?

5. Define Hydraulic subsidence value.

6. What is on site sanitation ?

7. What is meant by sludge volume index ?

8. How do you determine organic loading rate of a trickling filter ?

9. Define Sludge density index.

10. Name the methods of disposal of sewage by land treatment.

PART – B **(5×13= 65 Marks)**

11. a) Name any 5 physical characteristics of waste water and explain in short with reference to any five physical characteristics of waste water.

    (OR)

    b) Define dry weather flow. Explain the various sources of dry weather flow of sewage and also write short notes on various factors that affect the dry weather flow.

12. a) i) Explain the method of laying sewer line for the designed/desired alignment and gradient. **(7)**

    ii) Determine the diameter of a sewer (n = 0.013) carrying 0.0125 m^3/s of peak sewage flow at half a full depth. Take slope as 1 in 400. **(6)**

    (OR)

    b) i) List the sewer appurtenances commonly used ? Explain any two with neat sketches. **(9)**

    ii) List out the problems taken place during the pumping of sewage. **(4)**

13. a) i) Why the septic tank method of treating sewage is considered ineffective ? Under what circumstances a septic tank method of treating sewage is preferred ? **(3)**

    ii) Design a septic tank for a hostel of 150 persons. Let the desludging period be taken as one year and Length to breadth ratio as 2.5 : 1. Adopt peak discharge of 205 L$_{pm}$ surface area @ 0.92 m^2 for every 10 L$_{pm}$ of peak flow rate. Also design a soil absorption system dispersion trench for the disposal of the septic tank effluent, assuming the percolation rate as 100 L/m^2/d. Assume data wherever necessary. **(10)**

    (OR)

    b) i) Explain the velocity control devices in Grit channel. **(6)**

    ii) Discuss in brief various types of settling in sedimentation tanks. **(7)**

14. a) Design a high rate trickling filter from the following data :

    Design flow   :   40 ML/d

    Recirculation ratio   :   1.5

    BOD of raw sewage   :   250 mg/L

    Desirable effluent BOD :   20 mg/L

                (OR)

   b) Draw the typical process flow diagram for a UASB reactor and explain the working principle.

15. a) i) What do you understand by oxygen sag curve ? Derive the classical Streeter-Phelps oxygen sag curve. **(9)**

     ii) Discuss the principle of self purification process of river. **(4)**

                (OR)

   b) A wastewater effluent of 600 1/s with a BOD = 60 mg/l and temperature of 25°C enters a river where the flow is 30 m³/sec. and BOD = 3 mg/l, DO = 8.5 mg/l and temperature of 16°C deoxygenation constant for the waste is 0.10 per day at 20°C. The velocity of water in the river downstream is 0.15 m/s and depth of flow is 1.5 m/s and depth of flow is 1.5 m. Determine the following after mixing of waste water with the river water

     i) Combined discharge **(3)**

     ii) BOD **(3)**

     iii) DO **(3)**

     iv) Temperature **(4)**

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PART – C   **(1×15= 15 Marks)**

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16. a) Waste treatment plant is required to digest a sludge in such a way that the moisture content is reduced to 95% from the initial value of 96%. The inflow of sludge initially contains 70% volatile matter in the solid portion and during digestion only 60% of the volatile matter is destroyed : The specific gravity of volatile matter is 1.2 and that of fixed solid is 2.5. Calculate the volume of sludge before and after digestion if the inflow contains 2500 kg dry solids per day. Assuming 100 kg/m²/year solids loading rate, design the sludge drying bed required for dewatering operation.

                (OR)

   b) It is proposed to treat 18 ML/d of primary treated sewage with the help of a ASP system. The BOD of raw sewage is 280mg/L. Design the various components of ASP system by assuming the following parameters

    MLVSS in the reactor   =   2500 mg/L

    Return sludge concentration (VSS)   =   8000 mg/L

    MCRT   =   8 d

    Yield coefficient   =   0.45

    Decay coefficient   = 0.05 d^{-1}