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Question Paper Code : 50621

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Fifth/Sixth Semester

Environmental Engineering

EN 8592 – WASTEWATER ENGINEERING

(Common to: Civil Engineering)

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define 'Design period'.
2. What is population equivalent?
3. State the purpose of providing screen.
4. Mention the detention period for grit chamber and primary sedimentation tank.
5. Draw the symbiotic relation between bacteria and algae in stabilization pond.
6. What are extended aeration systems?
7. Write any two conditions favorable for disposal of sewage by dilution.
8. What causes soil dispersion?
9. State the objectives of sludge treatment.
10. Write the methods of dewatering of sludge.

PART B — (5 × 13 = 65 marks)

11. (a) Explain with neat sketch, the principles of one pipe system and two pipe system. (13)

Or

(b) A 350mm diameter sewer is to flow at 0.35 depth on a grade ensuring a degree of self – cleansing equivalent to that obtained at full depth at a velocity of 0.8m/sec. Calculate (i) the required grade, (ii) associated velocity and (iii) the rate of discharge at this depth. Assume required data. (13)

12. (a) Design a septic tank for the following data: (13)

Number of people – 100

Sewage/capita/day – 120 litres

Length: width – 4:1

What would be the size of its soak well if the effluent from the septic tank is to be discharged in it? Assume percolation rate through soak well to be 1250 L/m³/d.

Or

(b) (i) Design a suitable rectangular primary sedimentation tank for treating sewage from a city, provided with an assured water supply system, with a maximum daily demand of 12 million litres per day. Assume suitable detention period and other necessary data. (8)

(ii) Describe the type of screens. (5)

13. (a) (i) Explain with neat sketch the working principle of a UASB. (7)

(ii) Discuss the maintenance problem in a membrane bioreactor. (6)

Or

(b) Explain the working principle of SBR with neat sketch.

14. (a) (i) Discuss the factors affecting self purification of river. (8)

(ii) Explain with a sketch the oxygen sag curve. (5)

Or

(b) Explain with a neat sketch the types of sewage farming. (13)

15. (a) Mixed primary and secondary sludge of a wastewater treatment plant is thickened in the gravity thickener. Determine the volume reduction in the applied sludge after thickening of the sludge for the design data given below: (13)

Average influent flow – 5 MLD

Influent suspended solids – 200 mg/L

Influent BOD – 225 mg/L

Effluent BOD – 20 mg/L

Solids content of primary sludge – 3%

Solids content of secondary sludge – 0.9%

Solids content of thickened sludge – 4%

Assume necessary data.

Or

(b) Design a digestion tank for the primary sludge for the following data: (13)

Primary sludge flow – 20 MLD

Total suspended solids in primary sludge – 30000 Mg/L

Moisture content of digested sludge – 95%

Assume suitable data.

PART C — (1 × 15 = 15 marks)

16. (a) Explain the operational and maintenance aspects of an activated sludge process. (15)

Or

(b) Design a two stage high rate trickling filter for treating sewage of 4 MLD with a raw sewage BOD equal to 300 mg/L. Assume a recirculation ratio of 1.5 BOD removal in primary sedimentation tank as 35% and the final BOD of effluent as 20 mg/L. (15)