Code No:**R1641011** **R16** **Set No. 1**

IV B.Tech I Semester Regular/Supplementary Examinations, March – 2021

ENVIRONMENTAL ENGINEERING - II

(Civil Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B
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PART–A *(14 Marks)*

1. a) Explain the significance of Weir. [2]
   b) List the circumstances in which the sewage needs to be pumped. [3]
   c) Explain Nitrogen Cycle. [3]
   d) Describe Oxidation Ponds in detail. [2]
   e) Explain Anaerobic Process. [2]
   f) Write a short note on Biosolids. [2]

PART–B *(4x14 = 56 Marks)*

2. a) Explain Direct discharge method in detail. [7]
   b) Explain Velocity Area method for wastewater flow measurement in detail. [7]

3. Explain the following, with a help of figure. (a) static suction head (b) static discharge head (c) static head (d) friction head (e) velocity head (f) minor head loss (g) total dynamic head. [14]

4. a) The 5 day 30^0C BOD of sewage sample is 120 mg/L. Calculate its 5-day BOD at 20^0C. Assume the deoxygenation constant at 20^0C K_{20} as 0.1 [7]
   b) State the difference between BOD and COD. Calculate 1 day37^0C BOD of sewage sample whose 5-day BOD at 20^0C is 110 mg/L. [7]

5. a) A suspended growth anaerobic reactor is operated at an SRT of 30 d at a temperature of 30^0C. On a given day, the Methane Gas generation rate decreases by 30 %. List at least 5 possible causes that should be investigated and explain the source behind each one of them. [7]
   b) With a help of Fig. explain the modifications in Activated Sludge Processes. [7]

6. a) Explain Nitrification and Denitrification Process in Detail. [7]
   b) Explain the characteristics of Septic Tank Effluent and what kind of treatment is recommended. [7]

7. a) Explain Sludge settleability. [7]
   b) Determine the amount of methane generated per kg of ultimate BOD stabilized. Use glucose, $C_6H_{12}O_6$, as BOD. [7]

Code No: **R1641011** **R16** **Set No. 2**

IV B.Tech I Semester Regular/Supplementary Examinations, March – 2021

ENVIRONMENTAL ENGINEERING - II

(Civil Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B
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PART–A *(14 Marks)*

1. a) State the difference between Sanitary and combined sewer system. [3]
   b) Describe the Operating characteristics of pump. [3]
   c) Explain Sulphur Cycle. [2]
   d) Describe Aerated Lagoons in Detail. [2]
   e) Explain the O&M issues in Septic Tank. [2]
   f) Mention the COD standard for disposal of treated wastewater in surface water. [2]

PART–B *(4x14 = 56 Marks)*

2. Explain briefly the following (a) Manhole Size (b) Spacing (c) Transition and Turns in Manholes (d) Manhole Construction & Steps (e) Drop Manholes [14]

3. a) Explain Centrifugal and displacement pumps in detail. [7]
   b) List the pipe materials used for force mains and explain their advantage and disadvantages. [7]

4. a) Explain the significance of BOD and derive an expression for the first stage BOD. [7]
   b) Describe the significance of BOD/COD ratio in wastewater treatment. [7]

5. a) Explain how substrate gets reduced to end products, in anaerobic digestion. [7]
   b) An ASP has a tank influent BOD concentration of 111 mg/L, influent flow of 18,987 m^3/d) and14,233 kg) of suspended solids under aeration. Calculate the F/M ratio. [7]

6. a) Explain UASB in detail. [7]
   b) List the O&M issues while adopting for Membrane reactors. [7]

7. a) Explain Sludge Digestion Process in detail. [7]
   b) Explain Sludge Drying Beds. [7]

Code No:**R1641011** **R16** **Set No. 3**

IV B.Tech I Semester Regular/Supplementary Examinations, March – 2021

ENVIRONMENTAL ENGINEERING - II

(Civil Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B

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PART–A*(14 Marks)*

1. a) What should be characteristics of materials used for sewers? [3]
   b) Explain Surge relief valves. [3]
   c) Explain Carbon Cycle. [2]
   d) Describe RBC in Detail. [2]
   e) Why UASB fails. [2]
   f) Mention the BOD standard for disposal of treated wastewater in surface water. [2]

PART–B*(4x14 = 56 Marks)*

2. a) Write Short notes on (i) Design Period of different components in sewage system (ii) Time variations in sewage flow and their effects on design of sewer capacities [7]
   b) Describe Dry weather flow, average and maximum flow in detail [7]

3. a) Explain the role of diaphragm pump and pneumatic ejectors. [7]
   b) What is meant by ventilation of house sewers, and how is it achieved? Also discuss the uses of antisiphonage pipes in multistoried blocks. [7]

4. a) List the Operational difficulties in PST and explain the types of Flotation in detail. [7]
   b) Explain how bacterial density changes with time (with a Fig.) [7]

5. a) List out the kinetic equation used in the analysis of suspended growth process. [7]
   b) Explain Fluidized bed reactors and describe which Growth Process is best to adapt. [7]

6. a) The alkalinity concentration of anaerobic suspended growth reactor operated at 30^0C is 2700 mg/L as $CaCO_3$. If the equilibrium exists between liquid and gas phase with a CO_2 content in the gas phase of 30 %, determine carbonic acid concentration and pH of the reactor. (Acid Dissociation Constant at 30^0C is 4.677×10^{-7}, Henry Constant = 1862.1 atm, $HCO_3 = 56 \times 10^{-3}$ moles/L.). (Further assume the number of moles in dissolved gas in a litre of water is much less than the number of moles of water). [7]
   b) Explain how phosphates are removed in WWTP. [7]

7. a) The MLSS concentration in the aeration tank is 1800 mg/L & 3400 mg/L. The sludge settleability test showed that the sludge volume, settled for 30 min in a 2-L graduated cylinder, is 570 mL. Calculate the sludge volume index for both the MLSS Concentration and analyze the result with typical values of SVI. [7]
   b) Explain OxygenSag Curve in detail. [7]

Code No:**R1641011** **R16** **Set No. 4**

IV B.Tech I Semester Regular/Supplementary Examinations, March – 2021

ENVIRONMENTAL ENGINEERING - II

(Civil Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B

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PART–A*(14 Marks)*

1. a) Explain how will you test the newly laid sewer lines before bringing them into commission. [3]
   b) Name and explain the different types of traps used in house sewer connections. [3]
   c) State the difference between aerobic and anaerobic decomposition. [2]
   d) List the O&M issues in RBC. [2]
   e) How to recover a failed UASB? [2]
   f) Explain the principle of Septic Tank. [2]

PART–B*(4x14 = 56 Marks)*

2. a) What are the different types of pipes used in sewerage system? Compare their advantages and disadvantages. [7]
   b) Explain the forces acting on Sewer Pipes. [7]

3. Describe one pipe, two pipe system of plumbing for buildings and state their merits. Which one of these would you recommend for the toilet blocks of students hostel in campus of your institute and state why. [14]

4. a) With an example explain the types of settling in detail. [7]
   b) If the surface overflow rate is 34 $m^3/(m^2\ d)$ and the weir overflow rate is 355 $m^3/(d\ m)$. Determine the maximum radius for a circular primary clarifier with a single peripheral weir. [7]

5. a) If your nearby village authorities come up with a plan of establishing aerobic suspended growth process for treating wastewater (Ex: Activated Sludge Process), determine the volume of Aeration Tank and its dimensions with the following data: Town population - 20,000, Mixed Liquor Suspended Solids concentration - 2400 mg/L, BOD loading rate is 0.46 $kg/d/m^3$.Average BOD contribution per person - 0.089 kg/d. Further assume that 37 % of the sludge gets returned into the aeration tank. Depth of Tank =4 m. [7]
   b) Explain the O&M issues in Tricking Filters. [7]

6. Design a UASB reactor to treat sugar industry wastewater which is at 30^0C, with the following wastewater characteristics. Flow = 500 Cu.m/d. Assume 97% degradation of the soluble COD, 60 % particulate COD degradation, and an effluent VSS concentration of 200 mg/L. Determine,
    1. Amount of COD Removed
    2. Reactor Volume & Area (Assume a circular reactor)
    3. HRT & SRT
    4. Excess sludge to be wasted daily
    5. CH_4 gas production rate

    Design Assumptions
    - Yield = 0.08 g VSS/g COD
    - k_d = 0.03 g VSS/g VSS d
    - f_d = 0.15 g VSS/gVSS biomass decayed
    - Max OLR = 6 kg COD/m^3 d
    - Maximum up flow velocity = 0.5 m/h
    - CO_2 in gas phase 35 %
    - Process reactor height depth = 8 m
    - Avg solids conc. in the process reactor = 50 g VSS/L
    - Total bCOD = 6000 mg/L
    - Particulate COD = 40 %

    [14]

7. Discuss the ways available for disposal of sludge and the problems associated with it. [14]