Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

IV SEM- END SEMESTER EXAMINATIONS

SUBJECT: OE- I : WATER TREATMENT TECHNOLOGY

[CHE 4303]

REVISED CREDIT SYSTEM

Date : 20/06/2022 **Time: 2 – 5 PM** **MAX. MARKS: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A.	Describe the levels of wastewater treatment and classify the treatment process according to the level of advancement?	**(4 marks)**
1B.	A wastewater treatment plant discharges 1.0 m^3/s of effluent having an ultimate BOD of 40.0 mg/l into a stream flowing at 10.0 m^3/s. Just upstream from the discharge point, the stream has an ultimate BOD of 3.0 mg/l. The deoxygenation constant k_d is estimated as 0.22 day^{-1}. (i) Assuming complete and instantaneous mixing, find the ultimate BOD of the mixture of waste and river just downstream from the outfall. (ii)Assuming a constant cross-sectional area for the stream equal to 55 m^2, what ultimate BOD would you expect to find at a point 10,000m downstream.	**(3 marks)**
1C.	Draw a bacterial growth curve and explain the significance of various phases.	**(3 marks)**
2A.	Explain water demand per capita and give a flowchart for drinking water treatment	**(4 marks)**
2B.	A single source of BOD causes an oxygen-sag curve with a minimum downstream DO equal to 6.0 mg/l. If the BOD of the waste is doubled (without increasing the waste flow rate), what would be the new minimum downstream DO? In both cases assume that the initial oxygen deficit just below the source is zero and the saturated value of DO is 10.0 mg/l. Note that when the initial deficit is zero, the deficit at any point is proportional to the initial BOD.	**(3 marks)**
2C.	Why are screens necessary before the treatment of wastewater? Explain Settling velocity, Flow velocity and Approach velocity. Compare different types of settling.	**(3 marks)**

3A.	Write a short note on (i)Sedimentation (ii)Softening (iii) Sanitary and storm sewerage systems (iv)Aeration	**(4 marks)**
3B.	Laboratory studies on a wastewater having a total BODu of 150 mg/l have shown that after 45 min of contact with an activated sludge culture initially containing 2000 mg/l MLVSS, the filtrate BOD_u is reduced to 15 mg/l. Determine the aeration volume using the following design criteria. X_c = 200 mg/l as MLVSS θ_c = 8 days , SVI = 110 MLVSS = 0.8 × MLSS S_e = 15 mg/l of BOD_u, , Q = 2 MGD Y_T = 0.5, k_d = 0.1 day^{-1}	**(3 marks)**
3C.	What are the important operating parameters of aerobic and anaerobic secondary treatment process? Explain.	**(3 marks)**
4A.	Explain the major problems faced in Activated sludge process treatment systems.	**(4 marks)**
4B.	Design a high rate trickling filter for a design flow of 1200 m^3/day with an influent presettled BOD of 180 mg/lt. The effluent BOD after treatment not to exceed 20 mg/lt. Use Schulze equation, Rankine's equation and NRC equation for the design.	**(3 marks)**
4C.	Justify stabilization pond as a low cost treatment system. List their merits and drawbacks of the system.	**(3 marks)**
5A.	What is sludge digestion? Explain the principal methods of processing and disposal of sludge.	**(4 marks)**
5B.	Draw the flow diagram of the following treatment systems: (i) Secondary treatment with contact filtration and carbon adsorption (ii) Extended aeration process.	**(2 marks)**
5C.	Write a short note on applications of membrane technologies in wastewater treatment	**(4 marks)**