Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

IV SEMESTER B.TECH.

END SEMESTER EXAMINATIONS, June 2023

SUBJECT: OE- I : WATER TREATMENT TECHNOLOGY [CHE 4303]

REVISED CREDIT SYSTEM

Date : 02/06/2023 **Time: 2.30 to 5.30 pm** **MAX. MARKS: 50**

Instructions to Candidates:

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

1A.	A river is having discharge of 22 m^3 /s receives wastewater discharge of 0.5 m^3 /s. The initial DO of the river water is 6.3 mg/L, and DO content in the wastewater is 0.6 mg/L. The five day BOD in the river water is 3 mg/L, and the wastewater added to river has five day BOD of 130 mg/L. Consider saturation DO of 8.22 mg/L and deoxygenation and reaeration constant values of 0.1 and 0.3 per day, respectively. Find critical DO deficit and DO in the river after one day. The average velocity of flow in the stream after mixing of wastewater is 0.18 m/sec.	(3 marks)
1B.	Derive an expression for mean cell residence time, Sludge production rate and mass balance with biomass using suitable mass balance equations for the sludge wastage from recirculation line	(4 marks)
1C.	Show with a flow diagram the (i)Extended aeration process (ii) combined process of secondary treatment with contact filtration, carbon adsorption and reverse osmosis	(3 marks)
2A.	Give a short note on the water distribution system and its layout.	(3 marks)
2B.	What are the factors affecting per capita demand of water? Explain Nalgonda process.	(3 marks)
2C.	Draw a bacterial growth curve and explain the significance of various phases.	(4 marks)
3A.	Determine the size of high rate trickling filter for the following data: Flow rate = 4.5 MLD, Recirculation ratio = 1.5 BOD_5 of raw effluent = 250 mg/lt BOD removal in PST = 30% Find effluent BOD desired.	(4 marks)

	NRC Equation Single stage $V.F = \frac{W1}{5.08}\left(\frac{E1}{1-E1}\right)^2$ Second stage $V.F = \frac{W2}{5.08}\left(\frac{E2}{(1-E1)(1-E2)}\right)^2$ $F = \frac{1+R}{(1+0.1R)^2}$	
3B.	Describe any two types of high rate anaerobic reactors in detail.	(3 marks)
3C.	Explain the different modifications of ASP with a neat flow diagram	(3 marks)
4A.	Prepare preliminary designs for a rotary disc type installation to serve 1000 persons. Assume 80% BOD removal at an organic load of 20 g BOD_5/m^3.day and 3m diameter discs spaced 5 cm apart on centres. At 54 g of BOD/person.day and 200 lpcd, Flow Q is 200 m^3/day. $Se = \left[\frac{-Ka.A}{2Q} \pm \sqrt{\left(\frac{Ka.A}{2Q}\right) + S_o}\right]^2$ where, Ka = 2.3	(4 marks)
4B.	Write a short note on disinfection using chlorine, Ozone and UV based treatment of wastewater	(3 marks)
4C.	Describe the following terms along-with their significance (i) F/M ratio (ii) Volumetric Loading Rate (iii) Hydraulic Loading Rate (iv)Recirculation Ratio (v) Sludge age (vi) MLSS	(3 marks)
5A.	Explain the recent developments in Electro-dialysis and Reverse Osmosis.	(4 marks)
5B.	Explain stabilization pond and oxidation ditch as a low cost treatment system. List their merits and drawbacks of the system	(3 marks)
5C.	Enumerate the concept of zero liquid discharge and its application	(3 marks)