MANIPAL INSTITUTE OF TECHNOLOGY

(*A constituent unit of MAHE, Manipal*)

IV SEMESTER OPEN ELECTIVE – I

MAKEUP EXAMINATIONS, JULY 2022

SUBJECT: OE-I : WATER TREATMENT TECHNOLOGY

[CHE 4303] REVISED CREDIT SYSTEM

Date : 29/07/2022

Time: 2 – 5 PM

MAX. MARKS: 50

Instructions to Candidates:

✤ Answer ALL the questions.

✤ Missing data may be suitably assumed.

1A.	Explain about water distribution system and its layout. Write a short note on	
	Nalgonda process.	(3 marks)
18.	Prepare preliminary designs for a rotary disc type installation to serve 1000 persons. Assume 80% BOD removal at an organic load of 20 g of BOD_5/m^3 .day having 90% of BOD removed and 3m diameter discs spaced 5 cm apart on centres. At 54 g of BOD/person.day and 200 lpcd, Flowrate Q is 200 m ³ /day.	(4 marks)
1C.	Compare the advantages and disadvantages of using chlorine, ozone and UV for wastewater disinfection.	(3 marks)
2A.	 Just below the point where a continuous discharge of pollution mixes with a river, the BOD is 10.9 mg/l and DO is 7.6 mg/l. The river and waste mixture has a temperature of 20°C, a deoxygenation constant of 0.20 day⁻¹, an average flow speed of 0.30 m/s and an average depth of 3.0 m. (i) Find the time and distance downstream at which the oxygen deficit is maximum (ii)Find the minimum value of DO. 	(4 marks)
2B.	Show with a flow diagram the (i)Extended aeration process (ii) combined process of secondary treatment with contact filtration, carbon adsorption and reverse osmosis.	(4 marks)
2C.	What do you mean by sloughing and bulking?	(2 marks)

3A.	Explain any two major problems encountered in ASP systems?	(2 marks)
3B.	Write short notes on the following with diagram:	
	(i)UASB reactor	
	(ii)Fluidized Bed reactor	(4 marks)
3C.	Design a high rate trickling filter with a flow rate of 150 m ³ /hr. Influent BOD of raw wastewater is 180 mg/l. Effluent BOD is 30 mg/l. $k = 0.1 \text{ day}^{-1}$ at 20°C. The removable BOD is equal to 90% of the ultimate first stage BOD. Assume a depth of 2.7 m. Using Rankine's equation find the recirculation ratio and design the filter by NRC equation.	(4 marks)
4A.	A conventional activated sludge process plant is in operation with a θ_c of 10 days. Reactor volume = 8000 m ³ , MLSS = 3000 mg/l. Determine (i)Sludge wastage flow rate when wasting from the reactor (ii)Sludge wastage flow rate when wasting from the recycle line. Assume concentration of suspended solids in the recycle line as 10000 mg/l	(4 marks)
4 B .	What is flow equalization process? Which type of flow equalization is more efficient?	(2 marks)
4C.	Explain nitrification and De-nitrification process and compare their advantages and disadvantages	(4 marks)
5A.	Describe the following terms along-with their significance (i) Hydraulic retention time (ii) Solid retention time (iii)Volumetric Loading rate (iv)Hydraulic Loading rate (v)Recirculation Ratio (vi) Sludge age (vii) Sludge Volume Index (viii)F/M ratio	(4 marks)
5B.	Explain any TWO different modifications of ASP with a neat flow diagram	(3 marks)
5C.	Explain in detail the concept of zero liquid discharge.	(3 marks)