MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH. (CHEMICAL ENGINEERING)
MAKE UP EXAMINATIONS, FEB 2022

SUBJECT: PE – III: INDUSTRIAL WASTEWATER ENGINEERING
[CHE 4057]
REVISED CREDIT SYSTEM

Date : 24/02/2022   **Time: 2 – 5 PM**   **MAX. MARKS: 20**

> **Instructions to Candidates:**
> ❖ Answer **ALL** the questions.
> ❖ Missing data may be suitably assumed.

1A	Determine the size of high rate trickling filter for the following data: Flow rate = 4.5×10^6 lt/day, Recirculation ratio = 1.5 BOD_5 of raw effluent = 250 mg/lt BOD removal in PST = 30% Find effluent BOD desired	**(4 marks)**
1B.	A conventional activated sludge process plant is in operation with a θ_c of 10 days. Reactor volume = 8000 m³, MLSS = 3000 mg/l. Determine (i)Sludge production rate (ii)Sludge wastage flow rate when wasting from the reactor (iii)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)**
1C.	Describe the following terms along-with their significance (i) F/M ratio (ii) Volumetric Loading Rate (iii) Hydraulic Loading Rate (iv)Recirculation Ratio	**(2 marks)**
2A.	What is sloughing?	**(2 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.	**(4 marks)**
2C.	Design a facultative aerated lagoon to serve 40000 people.Wastewater flow is 7200 m³/day, Raw BOD_5 = 50 g/person-day or 277 mg/lt. Final BOD_5 concentration is not to exceed 40 mg/lt in winter season.Average ambient air temperature is 34 deg C and in winter it is 18 deg C.Assume ka at 20 deg C as 0.7 day-1, design temp is 26 deg C	**(4 marks)**