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MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL. (A constituent unit of MAHE, Manipal)

I SEMESTER M.TECH. (ENVIRONMENTAL ENGINEERING)

END SEMESTER EXAMINATIONS, 2023-24

SUBJECT: ADVANCED TREATMENT OF WATER AND WASTEWATER [CIE - 5118] **REVISED CREDIT SYSTEM**

(30 / 11 /2023)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

✤ Answer ALL the questions.

✤ Missing data, if any, may be suitably assumed.

Q No		Marks	СО	ВТ
1A	Illustrate the significance of bacteriological water quality parameters and describe the process of conducting MPN test.	05	CO1	3
1B	Illustrate the treatment of municipal wastewater having high levels of suspended solids and organic matter using a flow chart.	05	CO2	3
2A	Estimate the most probable number of the water sample, based on the following results of the bacteriological test. No of tubes tested Sample concentration positive results 5 10 4 5 1 2 5 0.1 1 5 0.01 0	05	CO2	3
2B	 Design a rectangular sedimentation tank for treating the sewage from a city having maximum daily water demand of 6 MLD. Assume a detention time of 2 hours, SOR as 30m³/m²/d and horizontal flow velocity as 0.3 m/minutes. Assume 80% of water supplied will become sewage. Calculate weir loading rate. 			4
3А	Design a conventional Activated sludge plant to treat domestic sewage given the following data: Wastewater flow = 5000 m ³ /day; BOD of sewage = 250 mg/l; BOD removed in primary treatment = 30%; Overall BOD reduction = 35%; F/M ratio = 0.35; MLSS concentration in aeration tank = 2500 mg/l; air required per kg of BOD removed = 100 m ³ air/kg BOD; endogenous respiration rate, $k_d = 0.04$. Also find SRT, HRT and rate of air supply required.	05	CO3	4
3B	Design a gravity thickener for an STP having the following primary and activated sludge characteristics.	05		

		Primary sludge	Activated sludge	Combined sludge		CO3	
	Specific gravity	1.03	1.005	1.02			4
	Solids, %	3.2	0.25				
	Flowrate, m3/d	350	3000				
	Assume the solids loading rate as 50 kg/m^2 .d.						
Explain the various types of primary sedimentation tanks using clear			ear of		3		
4A	4A illustrations.				05	004	
	Illustrate the various modifications of activated sludge process, and				and	CO4	3
4B	explain the key features and operating principles of any two of these				ese 05	004	
	modifications in c	letail using a nea	at sketch.				
E ۸	Demonstrate how	/ biological nitr	ification-denitrific	ation is achieved	in of	C05	3
ĴА	wastewater treatm	nent plants with	the help of a neat	sketch.	05	005	
5B	Explain the signi	ficance of F/M	ratio and solids	retention time in	the 05	CO5	3
	operation of secon	ndary treatment	process.		05	005	