

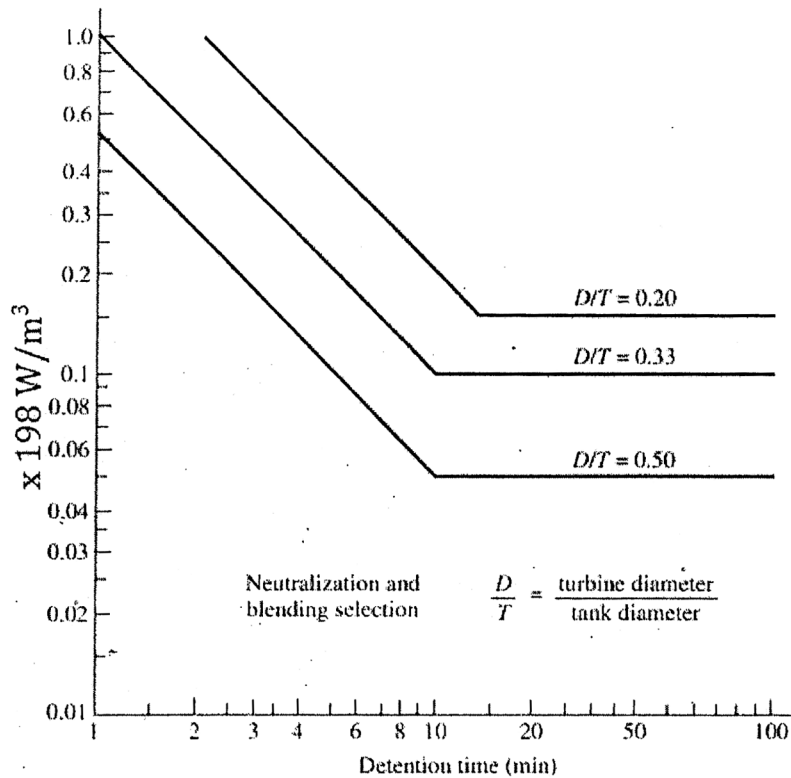
B.E. CIVIL ENGINEERING FOURTH YEAR SECOND SEMESTER EXAM 2025**SUBJECT: INDUSTRIAL WATER POLLUTION AND CONTROL****Time: 3 hours****Full Marks: 100****Instructions: Use Separate Answer scripts for each part.****Part - I Marks: 50**

Sl. No.	Question	CO	Marks																																																				
1	a. With a neat sketch describe the two basic modes of operation of Equalization tank. b. The hourly flow pattern of an industrial process is given below. Determine the volume of the equalization basin by Mass balance. <table><tr><td>Time</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>Noon</td></tr><tr><td>Inflow rate (m³/h)</td><td>2060</td><td>2455</td><td>2210</td><td>1890</td><td>1780</td><td>1550</td><td>1380</td><td>1260</td><td>1550</td><td>1640</td><td>1437</td><td>1486</td></tr><tr><td>Time</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>Midnight</td></tr><tr><td>Inflow rate (m³/h)</td><td>1320</td><td>1080</td><td>990</td><td>960</td><td>979</td><td>1050</td><td>1170</td><td>1230</td><td>1340</td><td>1650</td><td>2420</td><td>2175</td></tr></table>	Time	1	2	3	4	5	6	7	8	9	10	11	Noon	Inflow rate (m ³ /h)	2060	2455	2210	1890	1780	1550	1380	1260	1550	1640	1437	1486	Time	1	2	3	4	5	6	7	8	9	10	11	Midnight	Inflow rate (m ³ /h)	1320	1080	990	960	979	1050	1170	1230	1340	1650	2420	2175	[CO2]	[5+10]
Time	1	2	3	4	5	6	7	8	9	10	11	Noon																																											
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2	Briefly discuss about the different methods of neutralization.	[CO2]	[5]																																																				
3	Design a UASB type unit to treat average flow of 10 MLD municipal sewage in a single module. Peak flow is expected to be 2 x average flow. Average Flow = 7000 m³/d. Temperature range = 22 to 28 °C. The wastewater characteristics are as follows: pH = 7.2 -7.7 ; BOD = 380 mg/l ; COD = 850 mg/l ; SO₄ = 125 mg/l ; TSS = 390 mg/l ; VSS = 260 mg/l. The final effluent has to be suitable for land irrigation (namely, BOD<100 mg/l). Assume yield coefficient is 0.1 g VSS/g BOD removed; SRT value desired at given temperature = 40 days; Depth of sludge blanket = 2.5m; Effectiveness coefficient = 0.85	[CO3]	[10]																																																				
4	An equalization basin has a volume of 1.20 ML. The influent flow and BOD₅ data for several time periods are given below. Calculate the BOD₅ concentration in the basin effluent. It is given that the BOD₅ concentration in the effluent at 10 am is 130 mg/L. <table><tr><td>Time</td><td>Inflow (MLD)</td><td>Influent BOD₅ (mg/L)</td></tr><tr><td>10 am</td><td>0.36</td><td>250</td></tr><tr><td>11 am</td><td>0.55</td><td>200</td></tr><tr><td>12 noon</td><td>0.42</td><td>330</td></tr></table>	Time	Inflow (MLD)	Influent BOD ₅ (mg/L)	10 am	0.36	250	11 am	0.55	200	12 noon	0.42	330	[CO2]	[10]																																								
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5	Describe the method of chemical recovery performed in a pulp and paper industry.	[C05]	[5]																																																				
6	Describe the steps for a Chromium recovery system in Tannery industry.	[C04]	[5]																																																				

[Turn over

B.E. CIVIL ENGINEERING FOURTH YEAR SECOND SEMESTER – 2025**SUBJECT: INDUSTRIAL WATER POLLUTION AND CONTROL (CE/PE/B/T/422G)****Time: 3 hours****Full Marks: 100 [Part – I: 50 + Part – II:50]****Instructions: Use Separate Answer scripts for each part.****Part - II**

Sl. No.	Question	CO	Marks
1	What is the range of average waste water generation from dairy industry? What is the effluent standard of dairy wastewater? Suggest a suitable treatment methodology for wastewater from dairy wastewater.	[C03]	[3+3+4]
2	What is the range of average waste water generation from different type of meat processing unit? What is the composition of the wastewater? Suggest a suitable treatment methodology for wastewater from meat processing industry.	[CO4]	[3+3+4]
3	A waste stream of 0.6 m ³ /min and a temperature of 39.4°C contains significant quantities of non-emulsified oil and non-settleable suspended solids. The concentration of oil is 120 mg/L. Reduce the oil to less than 20 mg/L. Laboratory studies showed: Alum dose = 50 mg/L Pressure = 515 kPa absolute or 4.1 relative atm Sludge production = 0.64 mg/mg alum Sludge = 3 percent by weight Calculate: (a) The recycle rate (b) Surface area of the flotation unit (c) Sludge quantities generated The air/solids ratio for effluent oil and grease of 20 mg/L is found from a laboratory study: $\left(\frac{A}{S}\right) = 0.03$ mg air released/mg solids applied At 39.4°C the weight solubility of air is 18.6 mg/L. The value of f is assumed to be 0.85.	[CO2]	[10]
4	Waste water from a galvanizing shock industry is found to be highly acidic and requires neutralization prior to secondary treatment. The flow rate of waste water is 0.42 m ³ /min, pH is 1.5. This flow is to be required to rise a pH of 7 by using lime. From titration curve it is observed that 1 st stage requires 2100 mg/ltr and second stage requires 400 mg/ltr. Retention time is 5 – 10 min. Lime slurry consistency is 7-9 %. Assume depth of the tank in the range of 1.2 to 2 meter. Determine: i) Quantity of lime to be used. ii) Lime slurry storage tank volume. iii) Find out the power requirement of the mixture	[CO2]	[8]



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A waste with a total flow of 10,000 m³/d was characterized as shown in Fig. Extensive data were collected every 4 h for 17 d. The average BOD was 690 mg/L and the maximum value was 1185 mg/L. Design calculations with activated sludge systems have indicated that the effluent from the equalization basin must not exceed 900 mg/L (confidence limit = 99.86%) in order to meet the effluent quality criteria of an average BOD of 15 mg/L and a maximum concentration of 25 mg/L from the activated sludge system. Design an equalization basin to meet the desired effluent requirements.

[CO2]

[12]

