

Form A: Paper –Setting Blank

Ref No.: Ex/PG/CIV/PE/T/123A/2025

M.E. CIVIL ENGG. 1ST YEAR, 2ND SEMESTER EXAMINATION, 2025

SUBJECT: INDUSTRIAL WASTEWATER TREATMENT

(Name in full)

Full Marks: 100

Time: ~~Two hours/Three hours/Four hours/ Six hours~~

(60 marks for this part)

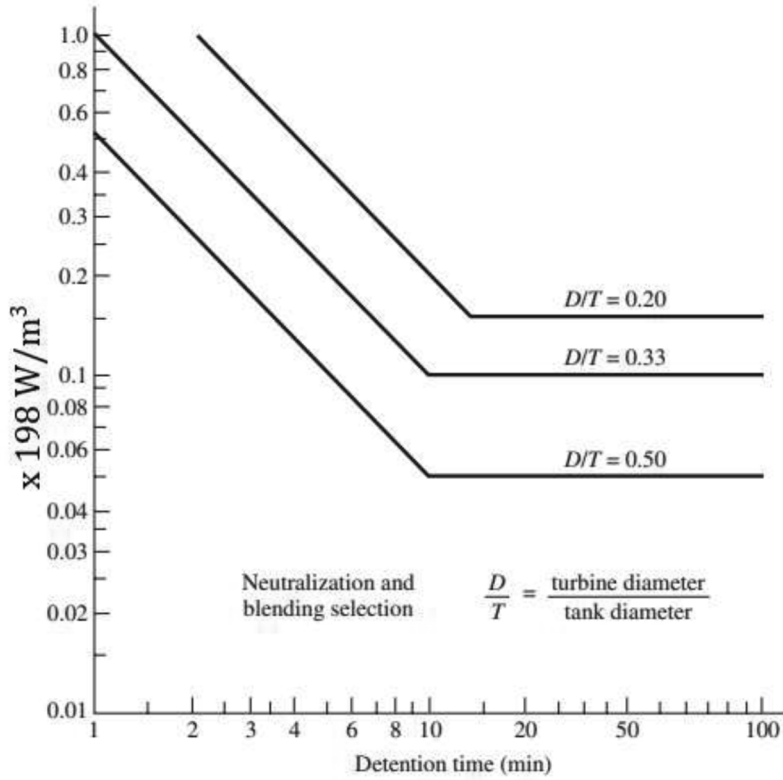
Use a separate answer-script for each part

No. of Question	Part-I	Marks
	<u>Attempt all questions</u>	
Q.1) a)	What do you mean by “bleaching of pulp”? What are the steps followed in the bleaching of pulp during the process of paper manufacturing?	(2+4)
b)	State the pollution abatement measures recommended for small scale bovine slaughter houses.	4
c)	How “ Recovery of Fat ” is carried out in modern dairy plants?	5
Q.2) a)	Describe with the help of neat flow diagram different processes involved in a typical mercury cell chlor-alkali unit .	7
b)	Describe with the help of pertinent reactions the purification of brine effected in a typical mercury cell chlor-alkali unit .	4
c)	Explain with the help of schematic diagram the process of “ demercurization of brine mud ”.	4
Q.3) a)	Draw a neat process flow chart for a market milk production unit.	6
b)	Discuss in brief on the following operations involved in market milk production. i) Pasteurization ii) Clarification	(2+2)
c)	Discuss in brief on different treatment alternatives recommended by CPCB for modern dairy plants.	5
Q.4) a)	Discuss on the steps involved in “ Chemical Pulping ” process of pulp manufacturing?	5
b)	How “ Chemical Recovery ” is practised in a typical small scale pulp and paper mill?	4
c)	Draw a neat process flow chart for a typical small-scale bovine slaughter house and mark the potential points of effluent generation.	6

[Turn over

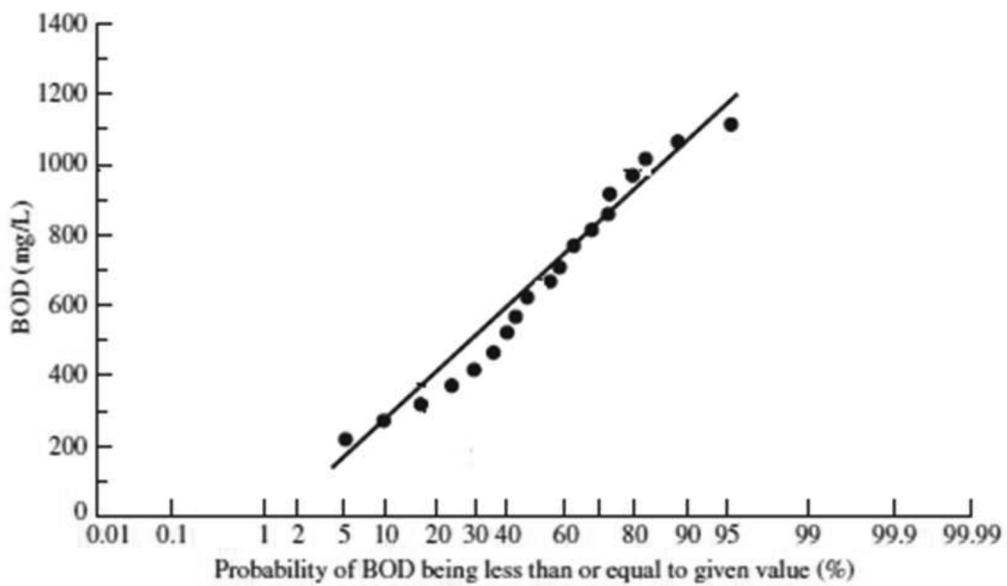
M.E. CIVIL ENGINEERING FIRST YEAR SECOND SEMESTER – 2025**SUBJECT: INDUSTRIAL WATER AND WASTEWATER TREATMENT
(PG/CIV/PE/T/123A/2025)****Time: 3 hours****Full Marks: 100 [Part – I: 60 + Part – II:40]****Instructions: Use Separate Answer scripts for each part.****Part - II**

Sl. No.	Question	CO	Marks																																																								
1	<p>A waste stream of 0.6 m³/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 130 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</p> <p>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.</p>		[10]																																																								
2	<p>Given the data in the table (flow is in ltr/min), design an equalization tank basin for a constant outflow from the basin:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Time :</th> <th>Flow</th> <th>Time :</th> <th>Flow</th> <th>Time :</th> <th>Flow</th> <th>Time :</th> <th>Flow</th> </tr> </thead> <tbody> <tr> <td>8 A.M.:</td> <td>209.27</td> <td>9 A.M.:</td> <td>358.26</td> <td>10 A.M.:</td> <td>802.79</td> <td>11 A.M.:</td> <td>1267.04</td> </tr> <tr> <td>12 P.M.:</td> <td>1235.62</td> <td>1 P.M.:</td> <td>539.96</td> <td>2 P.M.:</td> <td>330.69</td> <td>3 P.M.:</td> <td>444.25</td> </tr> <tr> <td>4 P.M.:</td> <td>312.83</td> <td>5 P.M.:</td> <td>557.81</td> <td>6 P.M.:</td> <td>860.64</td> <td>7 P.M.:</td> <td>1144.55</td> </tr> <tr> <td>8 P.M.:</td> <td>1338.45</td> <td>9 P.M.:</td> <td>812.79</td> <td>10 P.M.:</td> <td>312.83</td> <td>11 P.M.:</td> <td>217.12</td> </tr> <tr> <td>12 A.M.:</td> <td>244.98</td> <td>1 A.M.:</td> <td>218.20</td> <td>2 A.M.:</td> <td>141.42</td> <td>3 A.M.:</td> <td>123.56</td> </tr> <tr> <td>4 A.M.:</td> <td>141.42</td> <td>5 A.M.:</td> <td>142.49</td> <td>6 A.M.:</td> <td>161.42</td> <td>7 A.M.:</td> <td>132.48</td> </tr> </tbody> </table>	Time :	Flow	Time :	Flow	Time :	Flow	Time :	Flow	8 A.M.:	209.27	9 A.M.:	358.26	10 A.M.:	802.79	11 A.M.:	1267.04	12 P.M.:	1235.62	1 P.M.:	539.96	2 P.M.:	330.69	3 P.M.:	444.25	4 P.M.:	312.83	5 P.M.:	557.81	6 P.M.:	860.64	7 P.M.:	1144.55	8 P.M.:	1338.45	9 P.M.:	812.79	10 P.M.:	312.83	11 P.M.:	217.12	12 A.M.:	244.98	1 A.M.:	218.20	2 A.M.:	141.42	3 A.M.:	123.56	4 A.M.:	141.42	5 A.M.:	142.49	6 A.M.:	161.42	7 A.M.:	132.48		[14]
Time :	Flow	Time :	Flow	Time :	Flow	Time :	Flow																																																				
8 A.M.:	209.27	9 A.M.:	358.26	10 A.M.:	802.79	11 A.M.:	1267.04																																																				
12 P.M.:	1235.62	1 P.M.:	539.96	2 P.M.:	330.69	3 P.M.:	444.25																																																				
4 P.M.:	312.83	5 P.M.:	557.81	6 P.M.:	860.64	7 P.M.:	1144.55																																																				
8 P.M.:	1338.45	9 P.M.:	812.79	10 P.M.:	312.83	11 P.M.:	217.12																																																				
12 A.M.:	244.98	1 A.M.:	218.20	2 A.M.:	141.42	3 A.M.:	123.56																																																				
4 A.M.:	141.42	5 A.M.:	142.49	6 A.M.:	161.42	7 A.M.:	132.48																																																				
3	<p>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 m³/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 1st stage requires 2150 mg/ltr and second stage requires 350 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:</p> <p>i) Quantity of lime to be used. ii) Lime slurry storage tank volume. iii) Find out the power requirement of the mixture</p>		[8]																																																								



4

A waste with a total flow of 15,000 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 800 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.



[8]

