

B.E. CIVIL ENGINEERING FOURTH YEAR SECOND SEMESTER EXAM 2024
SUBJECT: INDUSTRIAL WATER POLLUTION AND CONTROL

Time: 3 hours

(50 Marks for each Part)

Full Marks: 100

Instructions: Use Separate Answer scripts for each part.

Part - I (50 Marks)

Sl. No.	Question	CO	Marks																																																				
1	<p>a. With a neat sketch describe the two basic modes of operation of Equalization tank.</p> <p>b. The hourly flow pattern of an industrial process is given below. Determine the volume of the equalization basin by Mass balance.</p> <table border="1"> <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>2050</td> <td>2435</td> <td>2200</td> <td>1840</td> <td>1760</td> <td>1560</td> <td>1330</td> <td>1250</td> <td>1500</td> <td>1600</td> <td>1467</td> <td>1456</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>1350</td> <td>1060</td> <td>940</td> <td>950</td> <td>969</td> <td>1040</td> <td>1150</td> <td>1250</td> <td>1370</td> <td>1600</td> <td>2400</td> <td>2135</td> </tr> </table>	Time	1	2	3	4	5	6	7	8	9	10	11	Noon	Inflow rate (m ³ /h)	2050	2435	2200	1840	1760	1560	1330	1250	1500	1600	1467	1456	Time	1	2	3	4	5	6	7	8	9	10	11	Midnight	Inflow rate (m ³ /h)	1350	1060	940	950	969	1040	1150	1250	1370	1600	2400	2135	[CO2]	[5+10]
Time	1	2	3	4	5	6	7	8	9	10	11	Noon																																											
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2	<p>a. Briefly discuss about the different methods of neutralization.</p> <p>b. An industrial effluent discharges 0.33 m³/min of wastewater with H₂SO₄ (0.16N) requires neutralization to a pH of 7.0 using a limestone bed. Assume limestone is 70% reactive. Hydraulic loading with depth of limestone bed to get pH of 7.0 are estimated from laboratory studies and results are furnished in the table below.</p> <table border="1"> <tr> <td>Depth, m</td> <td>0.16</td> <td>0.32</td> <td>0.64</td> <td>0.95</td> <td>1.14</td> </tr> <tr> <td>Hydraulic Loading, m³/m².hr</td> <td>1.6</td> <td>6.8</td> <td>36.5</td> <td>56.6</td> <td>64.3</td> </tr> </table> <p>Design neutralization system specifying</p> <p>a) Most economic limestone bed depth. Plot the flow rate per unit limestone volume vs. limestone bed depth.</p> <p>b) Weight of acid per day to be neutralized.</p> <p>c) Limestone requirements on a weekly basis.</p>	Depth, m	0.16	0.32	0.64	0.95	1.14	Hydraulic Loading, m ³ /m ² .hr	1.6	6.8	36.5	56.6	64.3	[CO2]	[5+10]																																								
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3	Write short notes on grab sample and composite sample.	[CO1]	[5]																																																				
4	Discuss the effect of Tannery waste water on receiving streams.	[C04]	[5]																																																				
5	Describe the method of chemical recovery performed in a pulp and paper industry.	[C04]	[5]																																																				
6	Describe the steps for a Chromium recovery system.	[C03]	[5]																																																				

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B.E. CIVIL ENGINEERING FOURTH YEAR SECOND SEMESTER – 2024

SUBJECT: INDUSTRIAL WATER POLLUTION AND CONTROL (CE/PE/B/T/422G)

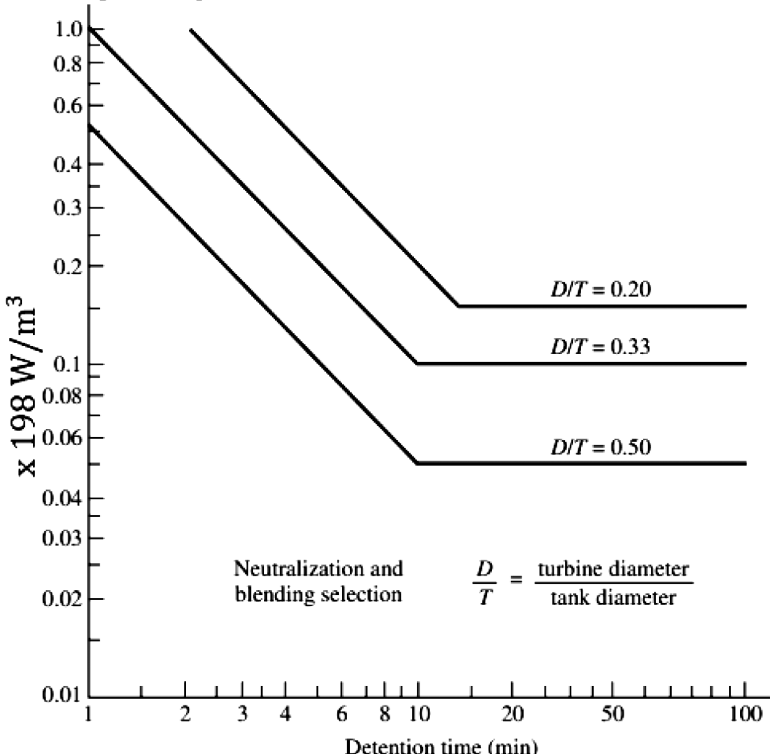
Time: 3 hours

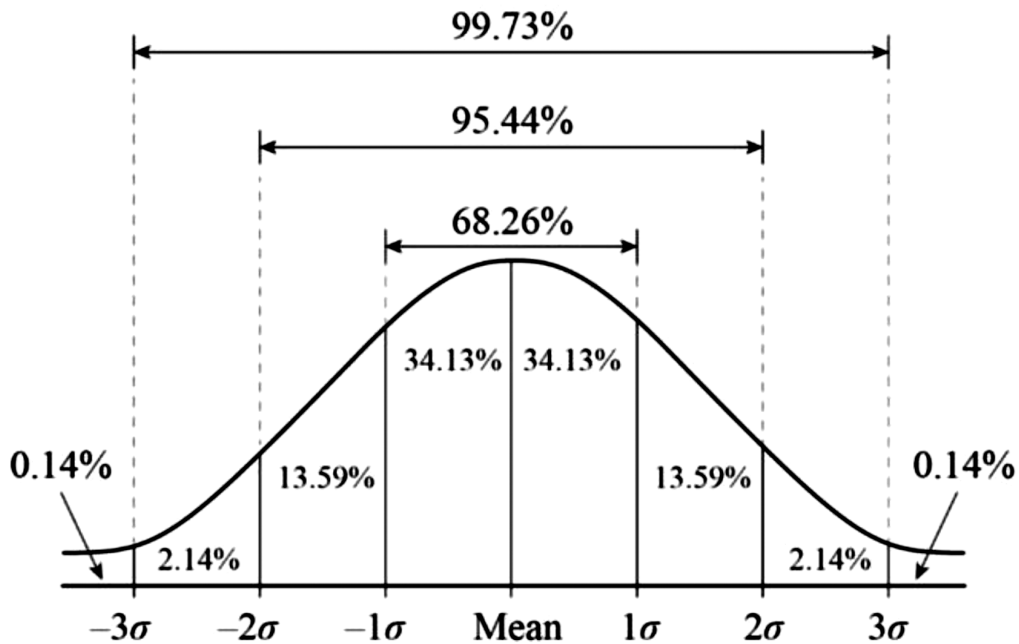
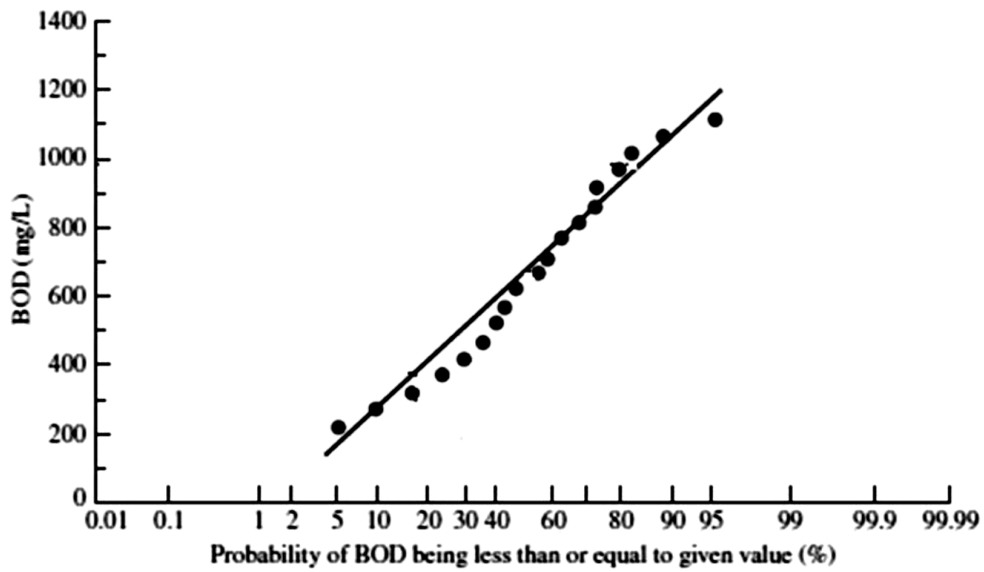
(50 Marks for each Part)

Full Marks: 100

Instructions: Use Separate Answer scripts for each part.

Part - II (50 Marks)

Sl. No.	Question	CO	Marks
1	<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 0.4 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 2000 mg/ltr and second stage requires 500 mg/ltr. Retention time is 5 – 10 min. Lime slurry consistency is 6-8 %. 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>  <p style="text-align: center;"> $\frac{D}{T} = \frac{\text{turbine diameter}}{\text{tank diameter}}$ </p>	[CO2]	[13]
2	<p>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 850 mg/L (confidence limit = 97.72%) in order to meet the effluent quality criteria of an average BOD of 10 mg/L and a maximum concentration of 20 mg/L from the activated sludge system. Design an equalization basin to meet the desired effluent requirements.</p>	[CO2]	[13]



<p>3</p>	<p>Design a flotation thickener without and with pressurized recycle to thicken the solids in activated sludge mixed liquor from 0.3 to 4%. Assume the following conditions:</p> <ul style="list-style-type: none"> i. $\frac{A}{S} = 0.008 \text{ ml/mg}$ ii. Air solubility: 18 ml/ltr iii. Recycled system pressure: 265 kPa iv. Fraction of saturation = 0.5 v. Surface loading rate: 8 ltr/m²-min <p>Sludge flow rate : 250 m³/day</p>	<p>[CO2]</p>	<p>[10]</p>
<p>4</p>	<p>Discuss suitable treatment methodology for wastewater from: i) meat processing industries; ii) Cashew-nut industry, iii) Slaughter house industry</p>	<p>[CO4]</p>	<p>[5+5+4]</p>