

B.E.C.E. 4<sup>th</sup> Year EXAMINATION, 2023  
(2<sup>nd</sup> Semester)

SUBJECT: ADVANCED ENVIRONMENTAL ENGINEERING (HONS.)

Full Marks 100

Time: Three hours

Use a separate Answer-Script for each part

Part I(60Marks for This Part)

No. of Questions	Part I(60Marks for This Part)	Marks
Q1.	<p><b>Answer all the questions. Assume any data if not provided. All the drawings should be in pencil.</b></p> <p><b>Section-A (CO1)</b></p> <p><b>Fill in the blanks:</b></p> <p>(i) Boron is an important parameter for _____ grade water quality.</p> <p>(ii) Self-purification factor is defined as the _____.</p> <p>(iii) After pollution discharge in a stream body the point where dissolved oxygen concentration is minimum is known as _____</p> <p>(iv) According to UNEP a country is known to be water stressed country if percapita water availability is _____</p> <p>(v) If all the other parameters kept constant only rate of degradation is reduced then the dissolved oxygen deficit will _____ than original.</p>	1×5
Q2. (a)	<p>A city of <math>2 \times 10^5</math> people deposits 37 cubic feet per second(cfs) of sewage having a BOD<sub>5</sub> of 28 mg/L and DO 1.8 mg/L into a river that has a flow rate of 250 cfs and a flow speed of 1.2 ft/s. Just at the upstream of the release point, the river has a BOD<sub>5</sub> of 3.6 mg/L and DO 7.6 mg/L. The saturation value of DO is 8.5 mg/L. The deoxygenation coefficient is 0.61/day and the reaeration coefficient is 0.76/day. Assume complete instantaneous mixing of the sewage and river. Find the distance for the river where DO concentration is minimum and the DO concentration of that point?</p>	8
(b)	<p>Write and discuss two physical factors responsible for self-purification of a river. With a neat sketch write a short note on different zones of pollution for a river.</p>	2+5
Q3. (a)	<p><b>Section-B (CO2)</b></p> <p>Define Mass transfer zone for column adsorption. Write the effects of following factors on adsorption process: surface area of adsorbent; solubility of the adsorbate; pH of the solution and temperature of the solution</p>	2+(2×4)
(b)	<p>Define breakpoint for column adsorption. Deduce the Freundlich adsorption isotherm equation</p>	2+8

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	<p><b>graphically</b> for the following data obtained from batch adsorption test of 1L volume.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Mass of Adsorbent (g)</th> <th style="text-align: left;">Equilibrium concentration of adsorbate in solution (mg/L)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>3.37</td> </tr> <tr> <td>0.001</td> <td>3.27</td> </tr> <tr> <td>0.01</td> <td>2.77</td> </tr> <tr> <td>0.1</td> <td>1.86</td> </tr> <tr> <td>0.5</td> <td>1.33</td> </tr> </tbody> </table>	Mass of Adsorbent (g)	Equilibrium concentration of adsorbate in solution (mg/L)	0	3.37	0.001	3.27	0.01	2.77	0.1	1.86	0.5	1.33	
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Q4.(a)	Deduce the expression for pollution degradation for plugflow reactor assuming 1 <sup>st</sup> order kinetics.	5												
(b)	Define dispersion number stating its unit. Differentiate between batch reactor and completely mixed stirred tank reactor.	2+3												
(c)	State two factors that should be considered during choice of reactors.	2												
Q5.	The following are data from an experiment to assess the disinfection of water supply to a given dose of chlorine. Determine the rate constant of disinfection graphically assuming 1 <sup>st</sup> order kinetics.	8												
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Time, min</th> <th style="text-align: left;">Percent Coliform bacteria remaining</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>100</td> </tr> <tr> <td>10</td> <td>70</td> </tr> <tr> <td>20</td> <td>21</td> </tr> <tr> <td>30</td> <td>6.3</td> </tr> <tr> <td>60</td> <td>0.6</td> </tr> </tbody> </table>	Time, min	Percent Coliform bacteria remaining	0	100	10	70	20	21	30	6.3	60	0.6	
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**B.E. CIVIL ENGINEERING FOURTH YEAR SECOND SEMESTER  
SUPPLEMENTARY EXAM 2023**

**SUBJECT: ADVANCED ENVIRONMENTAL ENGINEERING (HONS.) (CE/PC/H/T/423)**

**Time: 3 hours**

**Full Marks: 40**

**Instructions: Use Separate Answer scripts for each part.**

**Part - II**

<b>Sl. No.</b>	<b>Question</b>	<b>CO</b>	<b>Marks</b>
<b>1</b>	What are the sources of Bio-Medical Wastes? What are the different types of Bio-Medical waste and what are the different treatment & disposal options used for them? How Bio-Medical Waste can be disposed? How Bio-Medical Waste can be transported and stored?	[CO3]	[4+5+5+5] 5]
<b>2</b>	What is the unit of AQI? Which criteria air pollutants does not have any breakpoint for calculating Indian AQI?	[CO4]	[2+2]
<b>3</b>	Write a short note on the classification of E-waste. Write down about the hazard due to improper disposal of E-waste. Briefly discuss about the methods of E-waste estimation.	[CO3]	[5+6+6]