Ref No. –Ex/CE/PC/H/T/423/2024

B.E.C.E. 4th Year EXAMINATION, 2024
(2nd Semester)
SUBJECT: ADVANCED ENVIRONMENTAL ENGINEERING (HONS.)

Full Marks 100

Time: Three hours

Use a separate Answer-Script for each part

No. of Questions	Part I (60 Marks for This Part)	Marks

Answer all the questions. Assume any data if not provided. All the drawings should be in pencil.

Part-A (Related to CO1)

Q1. (a) **Differentiate between (write characteristic differentiations only)** 2×3

(i) Zone of active decomposition and zone of recovery

(ii) Point of confluence and critical point

(iii) Use based map and quality-based map

(b) **Write true or false with proper justification. <u>No marks will be given if justification will not be added.</u>** 1.5×4

(i) Streeter Phelp's Equation for determining oxygen content of different stretch of river is an accurate method.

(ii) Vertical stratification is common phenomena for river water.

(iii) If the depth of river increases the self-purification capacity of river decreases keeping deoxygenetation coefficient same

(iv) If reoxygenetation coefficient increases keeping all other parameters same then critical point shift leftwards.

Q2. A city discharges 1.3824×10^4 cum/day of sewage into an adjacent river whose minimum flow rate is 38.88×10^4 cum/day. Find out the degree of treatment of sewage required to satisfy river water quality for propagation of wild life and fisheries. Given 8

Parameters	River water	Sewage
Flow Rate (Cum/day)	38.88×10^4	1.3824×10^4
Temperature (°C)	24	24
BOD_5 at 20°C (mg/L)	0	719
DO (mg/L)	8.35	0.6
K1 at 20°C (/day)	0.1	
K2 at 20°C(/day)	0.3	
Cs (mg/L) at 24°C	8.35	

Part-B (Related to CO2)

Q3. (a) With neat sketch discuss the process of adsorption on adsorbent. Define mass transfer zone and breakthrough point with respect to column adsorption. 6+2×2

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Q3. (b) Write two assumptions behind Langmuir isotherm equation. Determine the Freundlich's isotherm equation for the batch adsorption study graphically. 2+8

Carbon Dose (mg/L)	0	5	10	25	50	100	150	200
Residual Concentration of Adsorbate (mg/L)	25.9	17.4	13.2	10.2	3.6	2.5	2.1	1.4

Q4.(a) Writing the basic mass balance equation derive the first order pollution removal kinetic equations for both plug-flow reactor (PFR) and completely mixed stirred tank reactor (CSTR). Writing justification choose which type of reactor you will recommend for these situations: 3×2 + 1.5×4

(i) Treatment of municipal wastewater

(ii) Treatment of industrial wastewater

(iii) Waste with high rate of degradation and above zero-order kinetics

(iv) For treatment of wastewater with different types of substrates

(b) Defining the dispersion number write the value of dispersion number for ideal CSTR and ideal PFR. Define half life for second order reaction kinetic. In a CSTR the chemical rate of reaction is given as r_C=-0.1[C]. degradation rate constant value is in d^{-1}. For 80% removal determine the volume of the reactor for a volumetric flow rate of 100L/s if initial concentration is 0.15mol/L. 2×3 +4

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

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

<table>
<tr><th>Sl. No.</th><th>Question</th><th>CO</th><th>Marks</th></tr>
<tr><td>1</td><td>A) What is the unit of AQI?
B) Which criteria air pollutants does not have any breakpoint for calculating Indian AQI and why?
C) Calculate the AQI for the given data:

<table><tr><td>Pollutants</td><td></td><td>Concentration</td></tr><tr><td>CO</td><td>Average over last 8 hours</td><td>1.6 mg/m^3</td></tr><tr><td>PM_{10}</td><td>Average over last 24 hours</td><td>20 µg/m^3</td></tr><tr><td>$PM_{2.5}$</td><td>Average over last 18 hours</td><td>75 µg/m^3</td></tr><tr><td>NH_3</td><td>Average over last 12 hours</td><td>325 µg/m^3</td></tr><tr><td>Tropospheric O_3</td><td>Average over last 8 hours</td><td>120 µg/m^3</td></tr></table></td><td>[C04]</td><td>[1+(1+2)+6] = 10</td></tr>
<tr><td>2</td><td>Answer any four:
A) What are the different types of Bio-Medical waste and what are the different treatment & disposal options used for them?
B) Write a short note on the classification of E-waste.
C) How Bio-Medical Waste can be disposed?
D) How Bio-Medical Waste can be transported and stored?
E) Write down about the hazard due to improper disposal of E-waste.
F) Briefly discuss about the methods of E-waste estimation.</td><td>[CO3]</td><td>[4 x 7 = 28]</td></tr>
<tr><td>3</td><td>What are the sources of Bio-Medical Wastes?</td><td>[CO3]</td><td>[2]</td></tr>
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