Ref No. –Ex/CE/PC/H/T/423/2023

B.E.C.E. 4th Year EXAMINATION, 2023
(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(60Marks for This Part)	Marks
	Answer all the questions. Assume any data if not provided. All the drawings should be in pencil.	
	Section-A (CO1)	2×5
Q1.	**Differentiate between** (i) Reaeration constant and deoxygenation constant (ii) Point of confluence and critical point in oxygen sag curve (iii) Zone of degradation and zone of recovery (iv) Quality based map and use based map (v) Water famine countries and water stressed counties	
Q2. (a)	An industry discharges 10^3 cum/day of sewage into an adjacent river whose minimum flow rate is 19×10^3 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)	19×10^3	10^3
Temperature (°C)	22.6	50
BOD_5 at 20°C (mg/L)	2	1250
DO (mg/L)	5.6	0.6
K_1 at 20°C (/day)	0.35	
K_2 at 20°C(/day)	0.55	
Cs (mg/L) at 24°C	8.35	

(b)	Write with justification that 'the DO concentration obtained from Streeter Phelp's Equation for a river is an approximate value'.	2
	Section-B (CO2)	
Q3. (a)	Write three significant differences between physical adsorption and chemical adsorption. With neat sketch explain the 4 mechanisms of adsorption. Define breakpoint for column adsorption.	3+(1+4) +2
(b)	**Mark the most appropriate one:** (i) Entropy change for adsorption is negative/zero/positive. (ii)An adsorption process is always exothermic/ always endothermic/ either of these two.	1×2
(c)	**Discuss the effects of** (i) particle size and porosity (ii) rate of adsorption and (iii)	1×3

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	concentration of feed on the thickness of mass transfer zone.	
Q3. (d)	A treated wastewater with a flowrate of 500L/min is to be treated with activated carbon to reduce the concentration of pollutant from 5mg/L to 1mg/L. The Freundlich adsorption isotherm equation is $q_e=150C_e^{0.5}$. Determine the annual cost requirement to treat the wastewater by the adsorption process assuming cost of adsorbent Rs 500/kg and density 450g/L.	5
Q4.(a)	**Write short note on:** Dispersion number; plug flow reactor; Non stirred type reactor; radial flow agitator; half-life for 2nd order reaction	2×5
(b)	**Mark the most appropriate one:** (i) Wastes with higher K values and 1st order reactions are removed better in _____PFR/CSTR (ii) For same size or detention time, plugflow reactor/complete mixing reactor show lesser efficiency.	1×2
(c)	1,3-Butadiene (CH2=CH—CH=CH2; C_4H_6) is a volatile and reactive organic molecule used in the production of rubber. Above room temperature, it reacts slowly to form products. Concentrations of C_4H_6 as a function of time at 326°C are listed in the following table. Determine the reaction order (among 1st and 2nd) and rate of reaction graphically for the experimental data obtained from a batch reactor.	8

Time (s)	C_4H_6 (mol/L)
0	1.72×10^{-2}
900	1.43×10^{-2}
1800	1.23×10^{-2}
3600	9.52×10^{-3}
6000	7.30×10^{-3}

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B.E. CIVIL ENGINEERING FOURTH YEAR SECOND SEMESTER – 2023

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

Time: 3 hours **Full Marks : 100**

Instructions: Use Separate Answer scripts for each part.

Part - II (40 Marks)

Sl. No.	Question	CO	Marks
1	What is the unit of AQI? Which criteria air pollutants does not have any breakpoint for calculating Indian AQI?	[C04]	[1+2]
2	Answer **any five**: 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.	[CO3]	[5 x 7 =35]
3	What are the sources of Bio-Medical Wastes?	[CO3]	[2]