Ref No. –Ex/CE/PC/H/T/423/2025

B.E.C.E. 4th Year EXAMINATION, 2025
(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) Write two probable reasons for water stress for a particular country. 2

(a) **In DO sag curve, differentiate between (write characteristic differentiations only)** 2×2

(i) Zone of degradation and zone of recovery

(ii) Inflection point and critical point

(c) **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 assumes "at any instant the deoxygenation rate is inversely proportional to the amount of oxidizable organic material present".

(ii) Streeter Phelp's equation for determining oxygen content of different stretch of river assumes "the reoxygenation rate and deoxygenation rate are directly proportional to the saturation concentration of dissolved oxygen".

(iii) Surface reaeration and photosynthesis are the mechanisms of reoxygenation for river water as assumed in Streeter Phelp's equation.

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

Q2. A city discharges 1.72 cum/sec of sewage into an adjacent river whose minimum flow rate is 7.240 cum/sec. Checking the critical DO concentration 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/sec)	7.24	1.72
Temperature (°C)	20	20
BOD_5 at 20°C (mg/L)	1.2	225
DO (mg/L)	80% of saturation	0
K1 at 20°C (/day)	0.1	
K2 at 20°C(/day)	0.5	
Cs (mg/L) at 24°C	9.17	

Ref No. –Ex/CE/PC/H/T/423/2025

B.E.C.E. 4th Year EXAMINATION, 2025
(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

Part-B (Related to CO2)

Q3. (a) Discuss the effects of the following factors on adsorption: Temperature and pH of the solution. Define mass transfer zone. Draw labelled breakthrough curve for column adsorption test for a pollutant adsorbable and non-biodegradable in nature. Write with proper justification, for the same pollutant where the breakthrough point will shift from standard consition if (i) concentration of influent increased; (ii) particle size of adsorbent decreased? 2×5

(b) State the assumptions behind Langmuir Isotherm equation. If a flask contains 100 ml solution of geosmin of concentration 0.12 mg/L, then determine the dosage of activated carbon required to be added in this flask for getting final remaining geosmin concentration of 0.05 mg/L. Assume for adsorbing geosmin activated carbon follows Freundlich isotherm model ($Q = 2.6 \times C^{0.73}$ where Q is mg adsorbate/mg adsorbent and C is the equilibrium concentration in mg/L). 2+3

(C) Design the dimension of a downflow mode column adsorber bed of activated charcoal for treating water having initial pollutant concentration 25mg/L of flowrate $0.15 m^3/s$. The isotherm experiment for getting desired effluent concentration 0.01 mg/L showed $(X/M)_{ult}$ = 0.06 mg adsorbate per mg of adsorbent. The column experiment study with 1inch column showed the height of mass transfer zone was 2mm and the mass of adsorbate retained within this zone was 12.5mg. Assume the interval of carbon replacement is once in a week and two parallel carbon bed are there. 5

Q4.(a) Determine graphically the rate of reaction for the decomposition of the following pollutant in a batch reactor. Also determine half-life for that pollutant. 8+2

Time (d)	0	1	2	3	4	5	6	7	8
Concentration (mole/L)	250	70	42	30	23	18	16	13	12

(b) Defining the dispersion number write the value of dispersion number for ideal CSTR and ideal PFR. Define diffused flow reactor. Considering second order kinetics ($r_c = -kC^2$) under steady state condition and initial concentration same for both reactors determine the ratio of volume of a complete mixed reactor (CMR) to that of a plug flow reactor (PFR) to achieve 90% reduction of that pollutant. 2×3 +4

Ref. No.: **Ex/CE/PC/H/T/423/2025**

B.E. CIVIL ENGINEERING FOURTH YEAR SECOND SEMESTER EXAM 2025

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	a) **What are the primary sources of biomedical waste?** b) **What are the various categories of biomedical waste, and what treatment and disposal methods are used for each?** c) **What are the available methods for the disposal of biomedical waste?** d) **How is biomedical waste transported and stored safely?**	[CO3]	[4+5+5+5]
2	a) **Provide a brief note on the classification of electronic waste (E-waste).** b) **Explain the hazards associated with the improper disposal of E-waste.** c) **Briefly describe the methods used for estimating E-waste.**	[CO3]	[5+6+6]
3	a) **What is the unit used to measure the Air Quality Index (AQI)?** b) **Which of the criteria air pollutants lacks a breakpoint for calculating the Indian AQI, and what is the reason for its exclusion?**	[CO4]	[1+(1+2)]