CONTROLLER OF EXAMINATIONS AU CHENNAI 600 025

Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. / B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, NOV / DEC 2025

DEPARTMENT OF CIVIL ENGINEERING

Semester VII

CE5023 & GEO-ENVIRONMENTAL ENGINEERING

(Regulation 2019)

Time: 3 hrs

Max. Marks: 100

CO 1	Understand basic knowledge of concepts and principles of Geo-environmental Engineering.
CO 2	Capable of selecting site for safe disposal of waste.
CO 3	Aware of soil stabilization by utilizing solid waste.
CO 4	Assess the contamination in the soil and to select suitable remediation methods based on contamination.
CO 5	Prepare the suitable disposal system for particular waste.

BL – Bloom's Taxonomy Levels
(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)

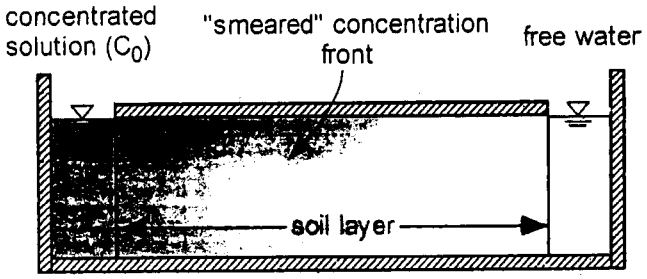
PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	Identify the characteristics of hazardous wastes.	2	1	L2
2	Interpret the causes of foundation failure arising from waste settlement or migration.	2	1	L2
3	Infer the key differences between liners and cover systems in an engineered landfill.	2	2	L3
4	Examine how different monitoring systems are applied to assess landfill performance	2	2	L3
5	Illustrate the source, pathway and receptor of petroleum contamination through graphical representation.	2	3	L2
6	Relate the characteristics of a breakthrough curve to the behavior of contaminant migration in soils.	2	3	L3
7	State any 4 inorganic additives/industrial waste used in soil stabilization.	2	4	L2
8	Compare micro- and macro-encapsulation methods based on their effectiveness in contaminant immobilization.	2	4	L3
9	State any 4 major ex-situ techniques involved in the bioremediation technology.	2	5	L3
10	Interpret the principle underlying electrokinetic remediation technology.	2	5	L3

PART- B (5 x 13 = 65 Marks)

Q. No	Questions	Marks	CO	BL
11 (a) (i)	Discuss how the following activities affect the environmental cycles and their consequences.	9	1	L2

	1. Industrial emission 2. Agricultural Runoff 3. Deforestation			
11(a) (ii)	Demonstrate your understanding of soil contamination by explaining the causes of soil pollution arising from industrial, agricultural, and urban sources.	4	1	L2
	OR			
11 (b) (i)	An offshore soil (predominantly clay) site experiences the presence of higher concentration of salt in pore water. Assess the change in index and engineering properties of soil and illustrate the process of soil-waste interaction and the principal mechanisms governing the interaction process.	13	1	L2
12 (a) (i)	Analyze, with neat sketches, the interrelationship among various components of engineered landfill systems, and evaluate their effectiveness in preventing contamination of soil and groundwater.	13	2	L4
	OR			
12 (b) (i)	Classify the various geosynthetic materials and demonstrate, with suitable examples, how each type is applied in landfill design and other solid waste management practices.	13	2	L4
13 (a) (i)	a) If a 2M solution of trichloroethylene (TCE) is maintained in the left reservoir or waste pond of Fig. 1 and the right reservoir is maintained with free water, the length of the aquifer is 120 m, and the diffusion coefficient is 10^{-9} m^2/s, what is the discharge rate of TCE into the stream at steady state? (6)  Fig.1 Conceptual illustration of contaminant transport b) If the difference in water level for the left waste pond and right stream is 1 m, the chemical concentrations in the pond and stream are the same, and the hydraulic conductivity of the aquifer is k = 10^{-8} m/s, what is the steady state advective flux of TCE into the stream? (7)	13	3	L3
	OR			
13 (b) (i)	(i) Examine the different chemical mechanisms influencing contaminant transport in the subsurface environment. (7) (ii) Interpret the principle of adsorption isotherms and compare different types through graphical explanation. (6)	13	3	L3
14 (a) (i)	Illustrate the role of fly ash properties in enhancing soil behavior and explain how it can be practically used as a stabilizing material.	13	4	L4
	OR			
14 (b) (i)	Evaluate the importance of soil stabilization in geotechnical engineering and analyze how the mechanisms of lime and cement stabilization differ in improving soil properties under	13	4	L4

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	varying field conditions.			
15 (a) (i)	Critically examine the physical and chemical mechanisms of the Solidification–Stabilization process with illustration, and analyze a real-world case study to assess its impact on contaminant immobilization and soil improvement.	**13**	**5**	**L5**
	OR			
15 (b) (i)	Evaluate and compare the mechanisms and types of thermal remediation processes for contaminated soil remediation, using suitable illustrations, and analyze their field applicability.	**13**	**5**	**L5**

PART- C (1 x 15 = 15 Marks)

(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16.	'Uncontrolled dumping of solid waste on the outskirts of the cities has become a common sight'. - Using the principles of waste classification, identify and categorize the different types of wastes generated from multiple sources across Chennai City. Evaluate and compare the criteria for selecting different types of landfill sites, analyze the role of constraint mapping in eliminating unsuitable areas, and explain how ranking techniques are used to determine the most appropriate site.	**15**	**2**	**L5**

