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PRESIDENCY UNIVERSITY

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

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Bengaluru

Mid Term Examinations - October 2026

Date: 05/10/2026 **Time:** 11:45 AM - 01:15 PM

Course Code: CIV3029 **Course Name:** Ground Improvement Techniques

Semester: Seventh Semester **Max. Marks:** 50 **Weightage:** 50%

CO - Levels	CO1	CO2
Marks	50	40

PART A: Answer Following Questions. 10 M

Q.N.	Questions	M	CO	BT
1	Standard and modified proctor tests	2	CO2	BT1
2	Pneumatic tyred and sheep foot rollers.	2	CO2	BT1
3	a) Blasting b) Vibratory Probe c) Vibratory compactors d) Vibroflotation	2	CO2	BT1
4	Disadvantages of Blasting Technique it suffers the disadvantages of non-uniformity, potential adverse effects on adjacent structures and the danger associated with the use of explosives in populated areas. It is suited when the soil is dry or completely saturated.	2	CO2	BT1
5	1) Increase shear strength 2) Reduce compressibility 3) Reduce permeability 4) Reduce liquefaction potential 5) Control swelling and shrinking 6) Prolong durability	2	CO2	BT1

PART B : Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
6	1) To increase strength, reduce erodability 2) To reduce distortion under stress 3) To reduce compressibility. 4) To control shrinkage and swelling. 5) To control permeability, reduce water pressure, and redirect seepage. 6) To prevent detrimental physical or chemical changes due to environmental conditions (freezing or thawing). 7) To reduce susceptibility to liquefaction. 8) To reduce natural variability of foundation soils	10	CO1	BT2

ANSWER KEY

7	FACTORS AFFECTING THE SELECTION OF GROUND IMPROVEMENT TECHNIQUES: 1) Type and degree of improvement required – Bearing capacity improvement, settlement reduction, permeability enhancement/decrease, long term/short term, liquefaction resistance. 2) Type of soil, geological structure, seepage conditions – Type of clay/sand and foundation, role of pore pressure and seepage, presence of difficult geological conditions. 3) Costs, equipment, specifications – Size of the project, availability of equipment, transportation costs, experienced contractors, specification of work, guidance documents. 4) Construction time – Construction time available, use of accelerated construction techniques. 5) Possible damage to adjacent structure or pollution of ground water resources - Tolerable levels of loading and deformation, pore water contamination. 6) Durability of the materials involved - Short term and long term, corrosion, aggressive soil condition. 7) Toxicity and corrosivity of any chemical additives – Government regulations may restrict the choice of additives. 8) Reversibility or irreversibility of the process. 9) Reusability of components such as steel, plastics, concrete etc. 10) Reliability of methods of testing, analysis and design. 11) Feasibility of construction control and performance measurements.	10	CO1	BT2

PART C: Answer Any 1 Following Questions. 15 M				
Q.N.	**Questions**	**M**	**CO**	**BT**
8	PROBLEMATIC SOILS The soil that causes additional problems from the engineering point of view as a result of its composition or a change in environmental conditions. 1) Collapsible soils 2) Expansive soils 3) Soft soils 4) Karst deposits 5) Waste deposit	15	CO1	BT2
9	EMERGING TRENDS: 1) Development of new machinery, particularly for deep compaction. 2) Availability of new construction materials, such as geo-synthetics. 3) Emergence of better guidelines for determining the suitability of specific techniques for certain types of soils and site conditions. 4) Better understanding of the geotechnical processes involved and appreciation of the significance of the construction sequence. 5) Refinement of methods of analysis and computer modeling techniques. 6) Advances in the techniques of performance evaluation of modified soils, such as pressure-meter tests and seismic shear-wave velocity measurements. 7) Microbes to stabilize the remediate soils. 8) Nanotechnology to modify the behavior of clay. 9) Nano-sensors to characterize and monitor the behavior of geo-materials and geo-systems. 10) Remote sensing and non-invasive ground based sensing techniques	15	CO1	BT2

PARTD: Answer Any 1 Following Questions. 15 M				
Q.N.	**Questions**	**M**	**CO**	**BT**
10	1 permeability 2 compressibility 3 Shear strength 4 swelling 5 shrinkage 6 soil structure 7 pore water pressure	15	CO2	BT3

ANSWER KEY

11	*i.e.*, $\frac{V_1}{V_2} = \frac{W/\gamma_1}{W/\gamma_2} = \frac{\gamma_2}{\gamma_1} = \frac{1+e_1}{1+e_2}$ Hence, $V_2 = V_1\left(\frac{1+e_2}{1+e_1}\right) = V_1\left(\frac{1-n_1}{1-n_2}\right)$ From equation 2.24, $e = \frac{G\gamma_w}{\gamma_d} - 1 = \frac{\gamma_s}{\gamma/(1+w)} - 1 = \frac{\gamma_s(1+w)}{\gamma} - 1$ Hence, $e_1 = \frac{\gamma_s(1+w)}{\gamma_1} - 1 = \frac{26.3(1+0.11)}{16.4} - 1 = 0.780$ Also, $e_2 = \frac{n_2}{1-n_2} = \frac{0.3}{1-0.3} = 0.429$ Hence, $V_2 = V_1\left(\frac{1+e_2}{1+e_1}\right) = 3500\left(\frac{1+0.429}{1+0.780}\right) = \mathbf{2810\ m^3}$ Now, $S_1 = \frac{w\gamma_s}{e_1\gamma_w} = \frac{0.11\times 26.3}{0.78\times 9.81} = \mathbf{0.378}$ $S_2 = \frac{w\gamma_s}{e_2\gamma_w} = \frac{0.11\times 26.3}{0.429\times 9.81} = \mathbf{0.687.}$	15	CO2	BT3

ANSWER KEY