BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: B.TECH **SEMESTER : IV/ADD**
BRANCH: CIVIL AND ENVIRONMENTAL ENGINEERING **SESSION : SP/2025**

SUBJECT: CE303 GEOTECHNICAL ENGINEERING

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Define consistency limits. Differentiate between each.	[5]	1	1
Q.1(b)	Soil to be excavated from a borrow pit which has a density of 1.75 gm/cc and water content of 12 %. The specific gravity of soil particles is 2.7. The soil is compacted so that the water content is 18% and dry density is 1.65 gm/cc. For 1000 cum of soil in fill, estimate i) the quantity of soil to be excavated from the pit in cum ii) the amount of water to be added. Also determine the voids ratios of the soil in borrow pit and fill.	[5]	1	3
Q.2(a)	At a construction site, a 3 m thick clay layer is followed by a 4 m thick gravel layer which is resting on impervious rock. A load of 25 kN/m^2 is applied suddenly at the surface. The saturated unit weight of the soils is 19 kN/m^3 and 20 kN/m^3 for the clay and gravel layers respectively. The water table is at the surface. Draw diagrams showing variation with depth of total, neutral and effective stress in the layers.	[5]	2	3
Q.2(b)	What are the factors which affect compaction and explain how these factors influence compaction	[5]	2	2
Q.3(a)	Derive the relation between angle of failure plane and angle of internal friction	[5]	3	2
Q.3(b)	A cylindrical soil specimen having cohesion of 50 kN/m^2 and angle of internal friction 30^0 is subjected to a cell pressure of 120kN/m^2 in a triaxial testing machine. Compute the a) maximum deviator stress b) angle made by the failure plane with the axis of the specimen c) normal and shear stresses on the failure plane.	[5]	3	3
Q.4(a)	Differentiate between general shear failure and punching shear failure	[5]	4	1
Q.4(b)	What are the corrections to be applied to observed SPT value? Why and how are the corrections applied?	[5]	4	2
Q.5(a)	When is strap or cantilever footing adopted? Explain the procedure for designing a strap foundation	[5]	5	1
Q.5(b)	Design a friction pile group to carry a load of 3000 kN including the weight of the pile cap at a site where the soil is uniform clay to a depth of 20m, underlain by rock. Average unconfined compressive strength of clay is 70 kN/m^2 .A factor of safety of 3 is required against shear.	[5]	5	3

::::::29/04/2025::::::M