Paper Code: ETEN 305 **L T C**

Paper: Geotechnical Engineering **3 1 4**

INSTRUCTIONS TO PAPER SETTERS:	**MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from question no. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only one question from each unit.

UNIT – I

Soil formation, properties and classification : Origin of soils, Composition of soil, particle size and shapes, Three phase diagram and relationships among void ratio, specific gravity, Dry density, porosity, Water content, Unit weights and degree of saturation, Classification of soils.

Laboratory and field identification of soil: Determination of water content, Specific gravity and grain size distribution for coarse grained and fine grained soils, Atterberg limits and indices, Visual identification by simple field test.

Permeability and seepage: Concept of pore water pressure, Total, Effective and neutral stresses. Darcy's law, Laboratory and field permeability tests, Seepage forces, Seepage through earth dams, Exit gradient and uplift pressure, Mechanics of piping, Methods of dewatering, design of filters.

[No. of Hours: 11]

UNIT – II

Stress distribution: Stress at a point, Concept of Mohr's circle, Calculation of stresses due to force of gravity, Point, Line and uniformly distributed loads, Influence charts, contact pressure distribution, Boussineque's equation for vertical pressure.

Consolidation and settlement : Consolidation test and compressibility characteristics, Terzaghi's theory of one dimensional consolidation, Types of clay deposits, Normal/over/under consolidated clays, Determination of pre-consolidation pressure and its significance, Time factor and coefficient of consolidation, Fitting methods, Settlement analysis.

[No. of Hours: 10]

UNIT – III

Soil improvement techniques: Compaction, Drainage and vibration methods, Grouting and injection, Chemical stabilization, Geomembranes and geotextiles

Compaction of soils: Objectives, Compactive effort, Laboratory compaction, Standard Proctor test, Concept of optimum moisture content and zero air voids line, Effect of compaction on soil properties, Compaction specifications and field control.

Shear strength of soil: Stress strain curve, Mohr-coulomb failure criteria, Laboratory and field measurement of shear strength of soil, Direct, triaxial and unconfined compression tests, Vane shear tests. Determination of shear strength parameters for different drainage and stress conditions, Measurement of pore pressure, Choice of test conditions, Shear strength of cohesive and granular soils.

[**No. of Hours: 10]**

UNIT – IV

Earth retaining structures: Gravity type retaining walls, Stability requirements, Backfill materials and drainage, Cantilever and Anchored sheet pile walls.

Bearing capacity of soils: Methods of determining bearing capacity, Analytical methods, Effect of water table, Safe bearing capacity, Foundation settlements, Plate load tests & Penetration tests.

Shallow foundations: Types of shallow foundations, Selection of type of foundation, Design of shallow foundations, Combined footings and Raft foundations.

Deep foundations: Classification of Piles, Pile driving equipment, Calculation of bearing capacity of a single pile, Pile groups, well and caisson.

[No. of Hours: 11]

Text and Reference Books:

1. P. Purushothama Raj, "Soil mechanics & Foundation Engineering", Pearson education
2. I.H. Khan, "Textbook of Geotechnical Engineering", Prentice Hall of India
3. R.B.Peck & Terzaghi, "Soil Mechanics in Engineering Practice", John Wiley
4. V.N.S. Murthy, "Soil Mechanics and Foundation Engineering".
5. C. Venkatramaian, "Geotechnical Engineering", New Age International Publishers.
6. Steven H. Kumar, "Geotechnical Earth Science Engineering", Pearson Publication.