

GEOTECHNICAL AND FOUNDATION ENGINEERING

Paper Code: ETCE-309

Paper: Geotechnical and Foundation Engineering

L	T/P	C
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 1 question from each unit. Each question should be 12.5 marks.

***Objectives:** To help students understand analyzing the bearing capacity of soils, to design shallow and deep foundations, to estimate the settlements, to design the rigid and flexible retaining structures and to design cuts and excavations. Students will learn various sub surface exploration techniques and methods of ground improvement.*

UNIT I

Sub surface exploration: Types of soil and rock sample, Indirect, direct and semidirect methods of sub surface exploration; Routine field tests, Location, spacing and depth of borings.

Bearing capacity of soils: Bearing capacity criteria and factors affecting it, Modes of shear failure, Theories of Bearing capacity, Foundation Pressures, Permissible settlements, Allowable bearing pressure, Field tests to estimate bearing capacity

Shallow foundations: Types of shallow foundations, selection of type of foundation, location and depth of foundation, causes of settlement, settlement analysis, Design of shallow foundations, design of combined footings, Mat foundations.

[T1][No. of Hours: 12]

UNIT II

Deep foundations : Classification of Piles, Pile driving equipment, calculation of bearing capacity of a single pile, Under-reamed piles, Pile groups, Uplift and Lateral resistance of piles, Inclined loading of piles, pile cap.

Drilled Piers: Types and uses, bearing capacity, settlement, construction procedures

Caissons: Types, uses and construction procedures.

[T2][No. of Hours: 12]

UNIT III

Lateral Earth Pressure : Limit analysis and Limit Equilibrium methods, Earth pressure at rest, Rankine's states of Plastic equilibrium, Earth pressure theories, Graphical methods to determine magnitude and location of resultant earth pressure; Concept of Arching of soils and braced cuts.

Earth retaining structures: Gravity type retaining walls: Proportioning retaining walls, stability requirements, backfill materials and drainage; Joints in retaining walls; Cantilever and Anchored sheet pile walls, Braced excavations.

[T1,T2][No. of Hours: 11]

UNIT IV

Stability of slopes: Short and long term failures, causes of failure, Types of landslides and slope movements, factor of safety, Concept of slope stability analysis, Infinite and finite slopes and their analysis, Selection of shear strength parameters, slope protection measures.

Soil improvement techniques: Compaction, Drainage and vibration methods, Precompression and consolidation, grouting and injection; Chemical stabilization, Geomembranes and geotextiles.

Environmental Geotechnology: Environmental and Natural cycles, Environmental imbalance, contaminated soils, Load environment design criteria.

[T1,T2][No. of Hours: 10]

Text Books:

[T1] R. B. Peck and Terzaghi, "Soil Mechanics in Engineering Practice", John Wiley

[T2] V.N.S. Murthy, "Soil Mechanics and Foundation Engineering", CBS

References Books:

[R1] Shashi K. Gulati and Manoj Datta, "Geotechnical Engineering", Tata Mc Graw Hill [2008].

[R2] Donald P. Coduto, "Geotechnical Engineering", Prentice-Hall India.

[R3] J.E.Bowles, "Foundation Analysis and Design", Mc-Graw Hill

[R4] N.P. Kurian, "Design of foundation Systems, Principles and Practices" Norsa Publisher

- [R5] Braja M. Das, Principles of Foundation Engineering, Cengage Learning
- [R6] P.C. Verghese, "Foundation Engineering" PHI Learning Pvt. Ltd.
- [R7] Karuna Moy Ghosh, "Foundation Design in Practice" PHI Learning Pvt. Ltd.
- [R8] Nihar Ranjan Patra, "Ground Improvement Techniques", Vikas Publishing House Pvt. Ltd.