

31073 SOIL MECHANICS AND FOUNDATION ENGINEERING

DETAILED SYLLABUS

Unit I

1.1 SOIL MECHANICS AND INDEX PROPERTIES

Introduction - Development of Soil Mechanics - Fields of application of Soil Mechanics - Soil formation - Cohesive and Cohesionless soil - Soil Properties - 3 Phase System - General, Index and Engineering properties - Detailed description - Atter Berg limits - Simple problems

1.2 HYDRAULIC PROPERTIES OF SOIL Introduction - Permeability - Co-efficient of permeability - Darcy's law - Factors affecting permeability - Permeability tests - Simple problems - Quick sand conditions

Unit II

2.1 CLASSIFICATION AND STRENGTH OF SOIL

Classification of soil - Introduction - Necessity - Systems of soil classification - Field identification of soil - Shear strength of soil - Introduction - Shear strength - Mohr's stress circle - Mohr-Coulomb failure theory - Shear strength test - Unconfined compression test - Mohr's circle for unconfined compression test - Compaction - Consolidation - Consolidometer - Optimum moisture content - Proctor's Compaction test - Methods of compaction - Degree of compaction - Field density of soil - Tests - Compaction and Consolidation - Comparison

2.2 STABILIZATION OF SOIL AND SUB-SOIL SAMPLING

Stabilization of soil - Introduction - Objects of stabilization - Methods of stabilization - Soil exploration - Introduction - Objects of soil exploration - Methods of soil exploration - Direct, Semi-direct and Indirect methods - Spacing and depth of test borings - Boring log - Sounding and Penetration tests - Geophysical methods - Sub-soil Sampling - Disturbed and Undisturbed samples - Types of samplers - Split spoon sampler - Thin-walled sampler - Chunk sampling

Unit III

3.1 SEEPAGE ANALYSIS AND SEEPAGE BELOW HYDRAULIC STRUCTURES

Seepage analysis - Introduction - Head, Gradient and Potential - Hydraulic gradient - Seepage pressure - Upward flow (Quick condition or Quick sand) - Types of flow lines - Types of flow (Definition only) - Two dimensional flow (Laplace equation) - Velocity potential - Properties of flow net - Uses of

flow net - Seepage below Hydraulic structures - Introduction - Hydraulic gradient - Piping - Exit gradient - Khosla's theory - Seepage flow nets below hydraulic structures

3.2 BEARING CAPACITY AND SETTLEMENT OF FOUNDATIONS

Bearing capacity - Introduction - Terminology - Factors affecting bearing capacity of soils - Methods of determining bearing capacity - Types of failure in soil - General, Local and Punching shear failure - Analytical methods - Rankin's analysis - Terzaghi's analysis - Assumption and limitations - Effect of water table - Methods of improving bearing capacity of soil - Settlement of foundation - Introduction - Causes and Effect of settlement - Plate load test - Simple problems

Unit IV

4.1 FOUNDATIONS

Foundation - Introduction - Definitions - Objectives - Requirements of foundation - Criteria for selection of type of foundation - Types of foundations - Shallow and Deep foundations - Types - Foundation at different levels - Foundation on made up grounds - Deep foundation - Introduction - Pile foundation - Uses of piles - Types of piles - Caisson foundation - Types - Selection of piles - Pile Driving - Capacity of piles - Pile load test - Floating foundation - Negative skin friction - Pile groups - Bearing capacity of pile groups - Settlement of pile group

4.2 FOUNDATIONS IN EXPANSIVE SOIL Introduction - Identification of expansive soil - Free Swell Test - Differential free swell test - Indian expansive soil - Swell potential and Swelling pressure - Traditional Indian practice - Methods of foundation in expansive soils - Replacement of soils and "CNS" concept - Under reamed pile foundation - Remedial measures for cracked buildings

Unit V

5.1 MACHINE FOUNDATION

Introduction - Soil dynamics - Free vibration and Forced vibration - Definitions - Natural frequency - Barkan's method Pauw's method - Types of machines and machine foundation - General requirements - Design of machine foundations - Reciprocating type - Centrifugal type - Impact type - Steps to design - Couzen theory - In-situ dynamic investigation of soil - Methods - IS code of practice - Design criteria - Isolation of foundation - Simple problems

5.2 FOUNDATIONS OF TRANSMISSION LINE TOWERS Introduction - Necessity - Forces on Tower Foundations - General design criteria - Choice and type of foundations - Design procedures - Stability conditions - Description – No problems REVISION AND TEST

Reference Book:

B C PUNMIA , “Soil Mechanics and Foundation Engineering”, Laxmi publications (P) Ltd., 2005 □ SWAMI SARAN , “Analysis and Design of Substructures” (LSD) – Second Edition 2010 □ V N S MURTHY , “Soil Mechanics & Foundation Engineering”–Sai Kripa Technical Consultants □ Dr S B SEHGAL, “A Text Book of Soil Mechanics”, CBS Publishers & Distributors □ WAYNE C.TENG, “Foundation Design”, Prentice Hall of India (P) Ltd.,