

Compulsory exam topics – 2023 Spring semester

Geotechnics I

1. Formation of soils
2. Phase (weight-volume) relationships
3. Grain size distribution test and hydrometer test
4. Atterberg limits
5. Compaction: purpose of compaction, technologies and quality control
6. Vertical stress in soil
7. Groundwater flow in soils
8. Determining the coefficient of permeability in laboratory and on the field
9. Quick condition (hydraulic failure)
10. Compression
11. Primary consolidation
12. Secondary consolidation
13. Mohr-Coulomb failure theory
14. Determining shear strength parameters in laboratory

Geotechnics II

1. Rankine earth pressure theory
2. Geotechnical design based on Eurocode: limit states, characteristic and design values, design approaches
3. Retaining structures: Gravity walls and types of gravity walls
4. Retaining structures: Embedded walls and types of embedded walls
5. Retaining structures: Reinforced soil walls and types of reinforced soil walls
6. Dewatering of earthworks, elements used for drainage
7. Quality control and its methods
8. Material classification, categories and general principles of material classification
9. Slope stability in general, calculation methods (for soils with no friction angle and no cohesion, Taylor's friction circle method)
10. In-situ tests in general and CPT
11. In-situ tests and dynamic probing, vane shear test, pressuremeter, SPT
12. Basic principles of earthquakes, wave types, intensity and magnitude
13. Liquefaction: phenomenon, susceptibility, cyclic-stress based empirical (simplified) calculation method
14. Methods of soil improvement
15. Geosynthetics: types and purposes

Geotechnics III

1. List the limit state in order of priority of geotechnical design
2. What are the geotechnical design categories, list and explain them?
3. Explain the elements of the bearing capacity formulas (drained and undrained)
4. What parameters are affecting the bearing capacity of a shallow foundation?
5. Explain the effects of decentralised/inclined loading. How can we determine the effective width/length?
6. What is the main difference between the strip/wall footing and the isolated footing? Where does the difference appear in the bearing capacity formula?
7. What are the effects on the shallow foundation for sliding?
8. For the sliding design of a shallow foundation where can we apply lateral soil pressure and in what limit state can we consider that and why?
9. What are the causes of settlement? What are the different stages of deformation? Draft the chart. What does failure mean?
10. Explain the A and B curve settlement behavior, when would you apply one and the other. List the steps of the settlement calculation.
11. Explain the stress distribution below foundation elements, how can we estimate the limiting depth. What does limiting depth represent?
12. Explain the steps of a cantilever retaining wall design
13. Explain the types of the pile foundations, what are the advantages and disadvantages? How do they transfer load to the ground?
14. Explain the design method of pile design based on CPT results