1. Describe the general steps taken to calculate the settlement of a foundation.
2. Explain the consolidation process.
3. Define the coefficient of consolidation.
4. What process is followed when calculating a failure load?
5. What is the Mohr Circle?
6. What is the Pole method?
7. How many Mohr circles are there at one point?
8. Give the general definition of a factor of safety.
9. Define the undrained shear strength of a clay.
10. Give the shear strength equation for soils.
11. A circular tower is built on a 5 m thick layer of clay underlain by bedrock. The clay behaves according to the stress strain curve shown on figure 1 and has a saturated unit weight of 18 kN/m³. The water table is at the ground surface. The diameter of the base of the tower is 15 m and it weighs 15000 kN.
   a) calculate the increase in stress at the middle of the clay layer under the center of the tower.
   b) calculate the settlement of the center of the base of the tower.
   c) calculate the maximum pressure that can be resisted by the soil if the clay has an undrained shear strength of 100 kPa.
   d) calculate the factor of safety against failure of the foundation.
12. If it takes 10 years for the consolidation settlement of a 5 m high embankment to take place, how long does it take for a 10 m high embankment?
13. A soil has a cohesion intercept of 5 kN/m², and a friction angle of 30 degrees.
   a) calculate the shear stress required to bring the soil to shear failure in a direct shear test if the normal effective stress on the failure plane at failure is 100 kPa.
   b) draw the shear strength equation line (Coulomb’equation) for this soil in the shear stress versus normal effective stress set of axes.
   c) in that same set of axes, draw the Mohr circle for the direct shear test of question 13 a) and determine the principal stresses.
14. For the retaining wall shown on Figure 2,
   a) calculate the horizontal pressure at the bottom of the wall.
   b) calculate the resultant push against the wall per unit length of wall and its point of application
15. For the slope shown on Figure 3, calculate the factor of safety against failure.