Practical 06: Problems

1. A joint plane has the following properties:
   JRC = 6 - 8
   $\phi_b = 30°$
   JCS = 50 MPa
   Calculate the shear strength on the joint plane if the normal stress 1 MPa.

2. A drill core specimen has a diameter of 54 mm and a length of 120 mm and is loaded axially with 800 kN.
   The axial shortening is 0,3 mm and the lateral expansion is 0,03 mm. The sample is loaded further and fail at 1 374 kN.
   a) calculate to uniaxial compressive strength
   b) calculate the deformation modulus at 800 kN
   c) Calculate the Poisson's ratio at 800 kN
   d) Calculate the Modulus Ratio at 800 kN.

3. The following table represents results from a direct shear box test on a planar discontinuity in weathered granite.
   The average normal pressure on the sample was 200 kPa.

Shear stress (kPa)	Shear displacement (mm)
159	0.05
200	1.19
241	3.61
228	4.50
214	8.51
207	9.40
200	11.61
193	12.60
179	17.09
179	19.81

   a) Plot a graph of shear stress vs shear displacement (shear stress on vertical axis) and determine the peak and residual shear strengths of the discontinuity.
   b) Plot a graph of the peak and residual shear strengths (vertical axis) against average normal stress on the surface and determine the peak and residual friction angles of the surface.

4. Calculate whether failure will take place in the sidewalls of a circular tunnel with a diameter of 4m. The rock mass has the following properties:
   Rock is quartzite with a UCS of 185 MPa.
   Lab tests indicate a m_i value of 12,7
   RQD of the rock mass is 75%.
   Joint spacing is between 30 - 50 cm with a soft infill of 1 mm.
   Joints are slightly rough and the rock mass is dry.
   The rock mass is confined by a vertical stress of 62 MPa and horizontal stress of 31 MPa.

5. A joint plane in rock has an area of 80 m2. Its roughness can be expressed as i_2 = 12° or JRC = 8 and its waviness as i_1 = 6°. A true cohesion of 100 kPa has been