Lab Practical (Answer Sheet) - Finite-Element Analysis

Below, enter the answers you obtain when prompted to do so during the different exercises:

Part A – The Basics

In this example, some of the basic features of a finite element analysis will be demonstrated through the modelling of a simple excavation using the Rocscience program PHASE^2.

1. What is the maximum total displacement experienced around the excavation (as prompted in steps 9 and 10)? Record your answers in mm.

   a) Elastic Analysis (E = 20 GPa): _____

   b) Elastic Analysis (E = 40 GPa): _____

   c) Elastic Analysis (E = 10 GPa): _____

2 What is the approximate relationship between the Young's Modulus and the maximum total displacement?

3. What is the maximum total displacement experienced around the excavation (as prompted in step 11)? Record your answers in mm.

   a) Elasto-Plastic Analysis (c = 12 MPa): _____

   b) Elasto-Plastic Analysis (c = 1.2 MPa): _____

   c) Elasto-Plastic Analysis (c = 0.12 MPa): _____

4. What is the approximate relationship between the cohesion and the maximum total displacement?

5. Comment on the maximum displacements calculated in Questions 1 and 3 above (i.e. the difference between the displacements calculated assuming an elastic and plastic analysis.

Part B – Materials & Staging

This tutorial will demonstrate the use of multiple materials and the effects of excavation sequencing for a longhole stope in an orebody excavated in the three stages and backfilled.

1. Sketch the distribution of the shear and tensile yield indicators for each of the first three stages (as prompted in step 14).

Stage 1	*Stage 2*	*Stage 3*

2. Based on the σ_1 and σ_3 stress distributions, the strength factor contours showing the percent of yielding in the rock mass, and the shear and tensile yield indicators, briefly assess the nature of the stress state and stability of the hangingwall and footwall, and the back and floor following each stope excavation stage (as prompted in step 14).

3. What is the maximum total displacement following each excavation/backfill stage (as prompted in step 15)? Record your answers in mm.

   a) Stage 1: _____

   b) Stage 2: _____

   c) Stage 3: _____

   d) Stage 4: _____

BONUS: What are the displacements for a non-staged and staged backfill operation (as prompted in step 15)?

	Maximum Total Displacement (mm)	
	without backfill staging	*with backfill staging*
Stage 1		
Stage 2		
Stage 3		
Stage 4		