**Question 1.6 Explain why it is necessary to know the stresses in rock ? [4]** 2

We need to know stress when we are excavating to determine if the overlying rock will stay in place or Fall.

We also need to measure stresses to determine the ultimate strength of a rock.

**Question 2.1** The following results were obtained during compression tests on two specimens of the same material. You may assume perfect linear behaviour and you may extrapolate.

| Specimen No. | Sigma 3 | Sigma 1 |
|---|---|---|
| 01 | 0 MPa | 100.0 MPa |
| 02 | 30.0 MPa | 190.0 MPa |

Where necessary, choose the appropriate formula (formulae) from the formulae listed below. A graphical approach is not acceptable for this question (Q. 2,1).

For the above rock material calculate / determine the following:-

UCS:- 100 MPa when confinement is zero UCS = 100 MPa [2] 2

Phi (φ):- $\phi = \sin^{-1} \times \frac{m-1}{m+1}$ $m = \frac{y_2 - y_1}{x_2 - x_1}$ [6] 6

$= \sin^{-1} \times \frac{3-1}{3+1}$ $= \frac{90}{30} = 3$

$= 30°$

C :- $c = b \times \frac{1-\sin\phi}{2\cos\phi} = 100 \times \frac{1-\sin(30°)}{2\cos(30°)} = 28{,}86$ MPa [5] 5

Intact shear strength :- $\tau = \sigma_n \tan(\phi) + C$ [2] 0

$= 3 \tan(30°) + 28{,}86 = 30{,}59$ MPa

What is the meaning of 'C', what is 'φ'?

c - cohesion

ϕ - angle of friction +2

φ = arc sin [(m – 1) / (m + 1)]  C = K sec φ

φ = arc sin (tan θ)  C = b [(1-sin φ) / 2 cos φ]

P.T.O