UNIVERSITI SAINS MALAYSIA

1st. Semester Examination
2000/2001 Academic Session

SEPTEMBER / OCTOBER 2000

EAG244/3 – Foundation Engineering and Soil Structural

Time : [3 hours]

Instruction to candidates:-

1. This paper consists of **SEVEN (7)** questions. Answer **FIVE (5)** questions only.

2. Answers **MUST BE** written in Bahasa Malaysia.

1. Table 1 contains the data of triaxial tests on samples of the same soil.

Table 1

Test	Confining Presure, kPa	Total Axial Stress (Deviatoric + Confining Pressure), kPa
1	1 000	3 000
2	2 000	4 900
3	2 600	6 100

a. By using the Mohr circle, determine the shear strength, □□= □ tan □ + c, for the soil.

(5 marks)

b. Based on Mohr circle constructions, determine the failure surface orientations, by appointing apropriate value for □ at an element taken from the surface of the sample (Figure 1).

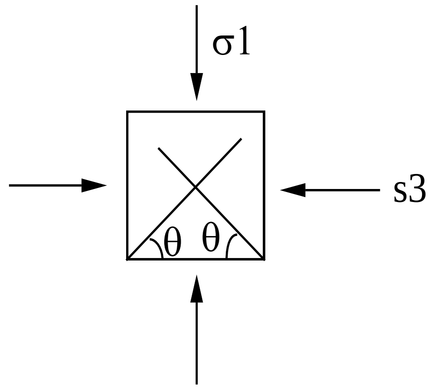


Figure 1

(5 marks)

c. If a confining pressure of 1 800 kPa is applied to a similar sample, based on Mohr circle construction, determine the deviatoric stress which is the additional pressure aplied to the horizontal surface until failure.

(5 marks)

d. A triaxial test with an applied torque is conducted which creates a shear of 800 kPa on an element on the surface of the similar sample, as shown in Figure 2. If the confining pressure is 1 800 kPa, determine the total axial stress which has to be applied, σ_V, to fail the sample.

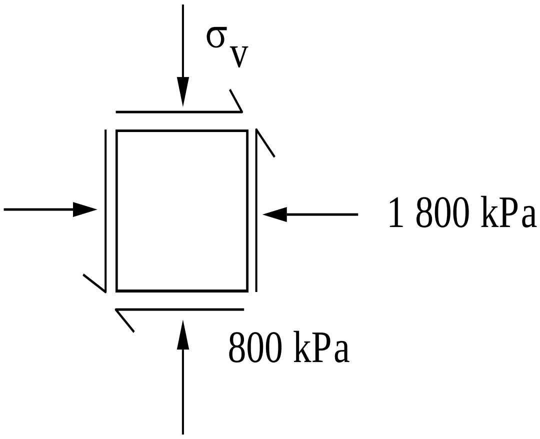


Figure 2

(5 marks)

2. Figure 3 shows a long slope. A layer of soil lies on top of a slanting bedrock. The shear strength of the soil rock interface is given as □□□□□ tan 38^o + 200 kPa. The unit weight of the soil is 18 kN/m^3 while the unit weight of the rock is 25 kN/m^3.

The pressure on AD and BC may be deleted in the following analyses.

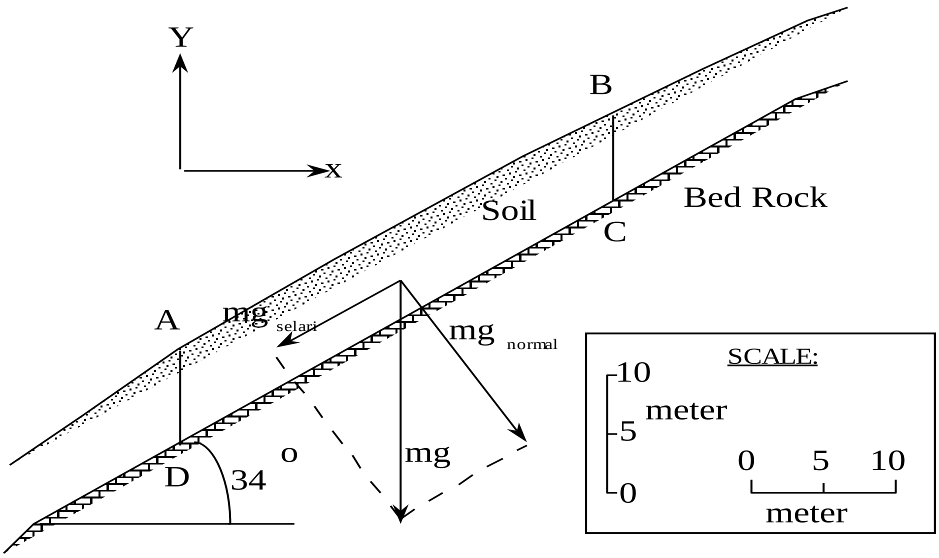


Figure 3

a. For a unit width of the slope (thickness in the z direction is 1.0 m), determine the weight of the block ABCD (mg in Figure 3). Determine the component of the weight in the direction normal to the surface of the bedrock (mg_{normal} in Figure 3). Determine the component of the weight in the direction parallel to the surface of the bedrock ($mg_{parallel}$ in Figure 3).

b. For the block ABCD, determine the normal and shear stresses at the surface of the bedrock. Determine the shear strength based on the given formula. Finally, determine the Factor of Safety (FOS) for the slope based on :

$$\text{FOS} = \frac{\text{Shear Strength}}{\text{Shear Stress}}$$

(5 marks)

c. For the block ABCD, based on the normal and shear forces, determine the Factor of Safety of the slope usingh:

$$\text{FOS} = \frac{\text{Shear Strength}}{\text{Shear Load}}$$

(5 marks)

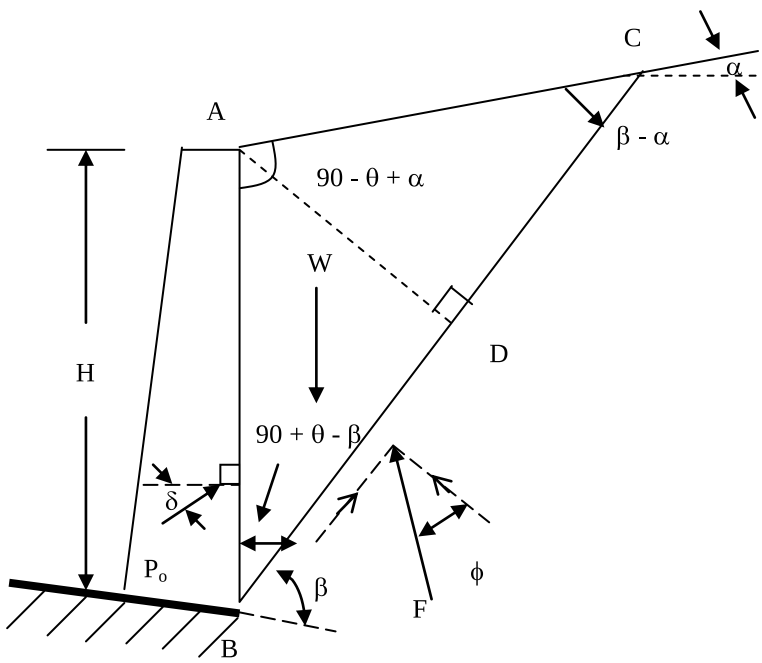
d. If the bedrock slope could be altered, determine the slope angle when the overlying soil is at the threshold of sliding.

(5 marks)

3. (a) Dengan berbantukan Bulatan Mohr, terangkan proses kegagalan aktif.

(3 markah)

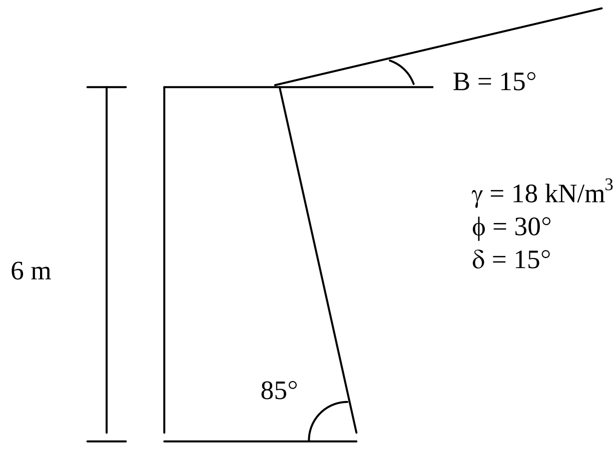
(b) Berdasarkan Rajah 4, dapatkan lakaran segitiga keseimbangan daya untuk pengiraan nilai Pa.



Rajah 4

(4 markah)

(c) Berdasarkan Kaedah Culman, dapatkan nilai Pa untuk tembok penahan seperti rajah 5.

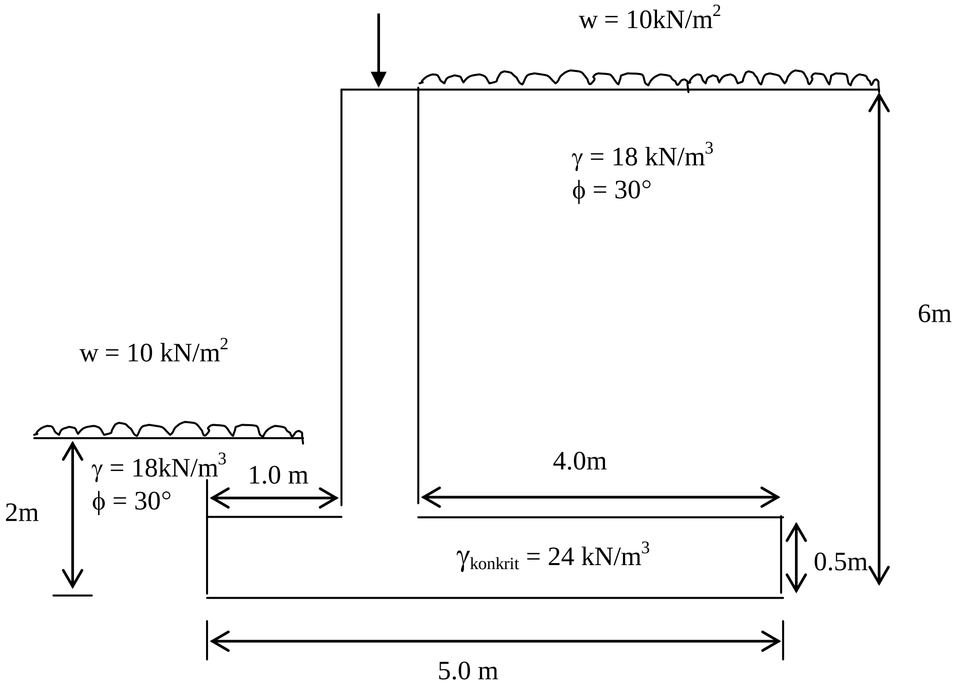


Rajah 5

(13 markah)

4. Sebuah tembok penahan akan dibina di satu kawasan perumahan. Dimensi tembok penahan adalah seperti Rajah 6.

Anda diminta merekabentuk sepenuhnya tembok penahan ini. Aras air tanah berada jauh dari permukaan tanah.



Rajah 6

(13 markah)

…6/-

(a) Dengan berbantukan lakaran, terangkan jenis-jenis tembok penahan.

(3 markah)

(b) Terangkan kegunaan sistem penyaliran air di belakang tembok penahan. Lakar **DUA (2)** sistem penyaliran air di belakang tembok penahan.

(4 markah)

5. (a) Determine the maximum allowable column load for a 2 m square footing founded in a clayey sand at a depth of 1.25 m. The cohesion and friction angle of the clayey sand in terms of effective stresses are 10 kpa and 29 degree. The unit weight of the clayey sand and concrete are 18 kN/m^3 and 22 kN/m^3 respectively.

(10 marks)

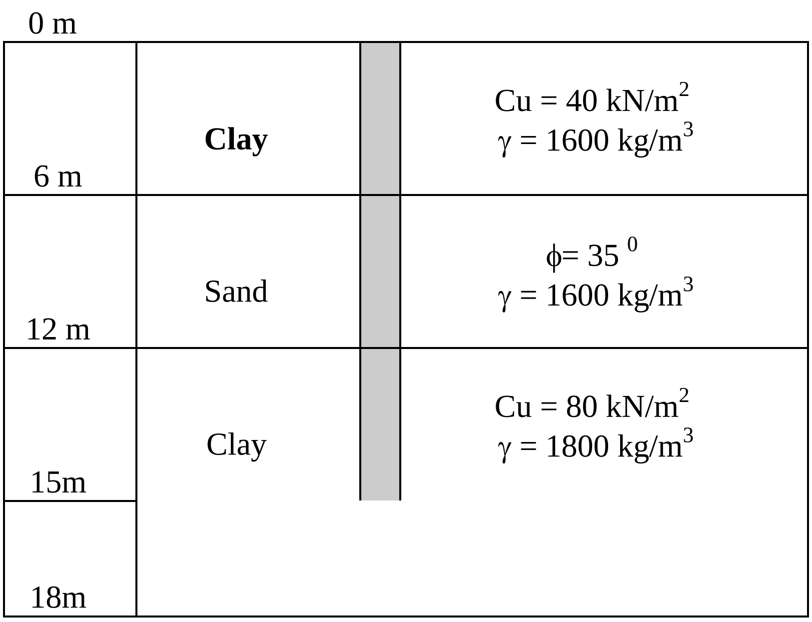
(b) A strip footing is designed to carry a load of 800 kN/m at a depth pf 1 m below ground level.. The cohesion of the soil is found to be 60 kN/m2 and the angle of internal friction is 0 degree. Determine the width of the footing if a factor of safety 3.0 used. The water table is at 5 m below ground level. Assumed the bulk density and saturated density of the soil are 1.65 mg/m^3 and 2.10 Mg/m^3 respectively.

(10 marks)

6. (a) Describe <u>**THREE**</u> **(3)** classification of piles which are normally used in geotechnical engineering. Use sketches to support your answer.

(4 marks)

(b) A concrete pile of 450 mm diameter was driven inside a layer of non homogenous soil to a depth of 15 m.



Determine:

i) Skin Friction of the pile. (4 marks)
ii) End bearing of the pile. (4 marks)
iii) The ultimate capacity of the pile. (4 marks)
iv) The ultimate of a group of 2 x 2 piles as above with a distance 1 m c/c. (4 marks)

(state your assumption clearly)

7. (a) Explain briefly the main and the specific objectives of conducting the Site Investigation.
(4 marks)

(b) Suggest a list of procedures that would be practical to implement in order to obtain information on surface and subsurface conditions appropriate for construction planning for a proposed project site that extends over a large area that is presently in a natural, undeveloped state.
(6 marks)

(c) In soil boring, what is the standard penetration test? (4 marks)

(d) Proposed a project. Explain in detail the location and tests to be conducted in Site Investigation
(6 marks)

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