



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2012/2013**

COURSE NAME : ENGINEERING GEOLOGY
COURSE CODE : BFC 21303
PROGRAMME : 2 BFF
EXAMINATION DATE : JUNE 2013
DURATION : 3 HOURS
INSTRUCTION : 1. ANSWER ALL QUESTIONS IN
PART A (COMPULSARY)
2. ANSWER ANY **FOUR (4)**
QUESTIONS IN **PART B**

THIS QUESTION PAPER CONSISTS OF SEVEN (7) PAGES

PART A

- Q1 (a)** Briefly explain the discontinuity characteristics that are observed in rock slope mapping. (5 marks)

- (b) Investigations at a rock slope site gave the following information.

Height of rock slope	= 50m
Proposed Slope face angle	= 73°
Critical discontinuity angle	= 50°
Depth of tension cracks	= 5m
Unit weight of the rock	= 26 kN/m ³
Unit weight of water	= 9.81 kN/m ³
Cohesion of the discontinuity	= 100 kPa
Friction angle for the discontinuity	= 35°

Using the information given in Figure **Q1(b)** for a planar failure, examine the factor of safety:

- (i) When the tension crack and the slope is dry, and (3 marks)
- (ii) When the tension crack is completely filled with water. (2 marks)
- (c) A rock cut slope has a dip direction 045° and dip angle of 70°. A discontinuity survey was conducted along the proposed cut slope and results for the discontinuity sets orientations are given in Table 1. A study of the joint sets showed that all joint surfaces had a friction angle of 30°.

Table 1

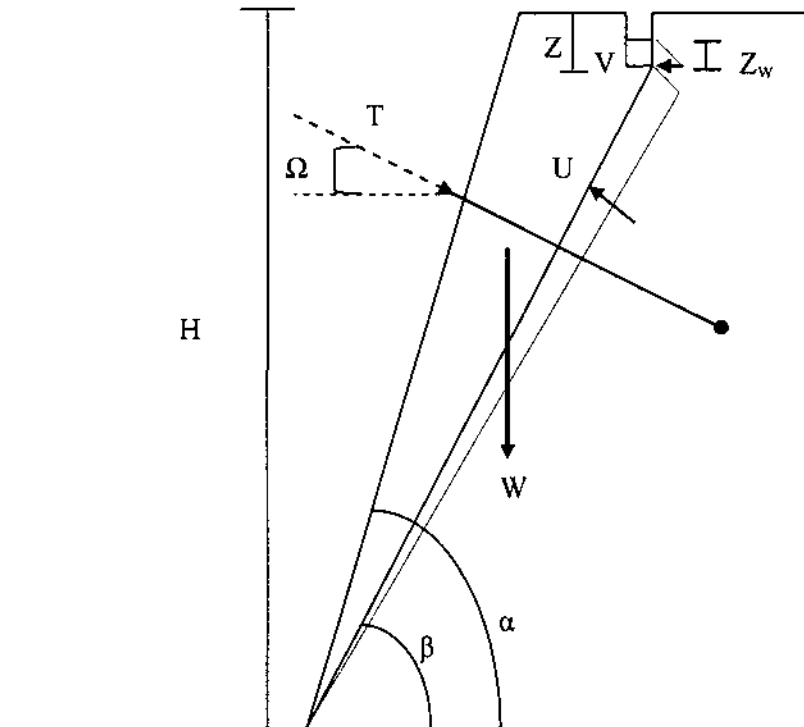
Joint set 1	Joint set 2	Joint set 3	Joint set 4	Joint set 5
040°/52°	060°/70°	145°/30°	230°/80°	350°/70°

- (i) Analyze the entire failure mode for both proposed rock slope as well as the criterion as an evidence using Figure **Q1(c)**. (6 marks)
- (ii) Recommend a new and suitable rock slope dip angle in order to avoid potential any rock slope failure. (2 marks)
- (iii) Suggest the consequences of the above recommendation. (2 marks)

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Given:

$$\text{FOS} = \frac{cA + [W \cos\beta - U - V \sin\beta + T \sin(\Omega + \beta)] \tan\phi}{W \sin\beta + V \cos\beta - T \cos(\Omega + \beta)}$$

$$A = (H - Z) \text{cosec } \beta$$

$$W = \frac{1}{2} \gamma_s H^2 \left[\left(1 - \left(\frac{Z}{H} \right)^2 \right) \cot\beta - \cot\alpha \right]$$

$$U = \frac{1}{2} \gamma_w Z_w (H - Z) \text{cosec } \beta$$

$$V = \frac{1}{2} \gamma_w Z_w^2$$

$$\text{cosec } \beta = \frac{1}{\sin \beta}$$

$$\text{sec } \beta = \frac{1}{\cos \beta}$$

$$\cot \beta = \frac{1}{\tan \beta}$$

FIGURE Q1 (b)

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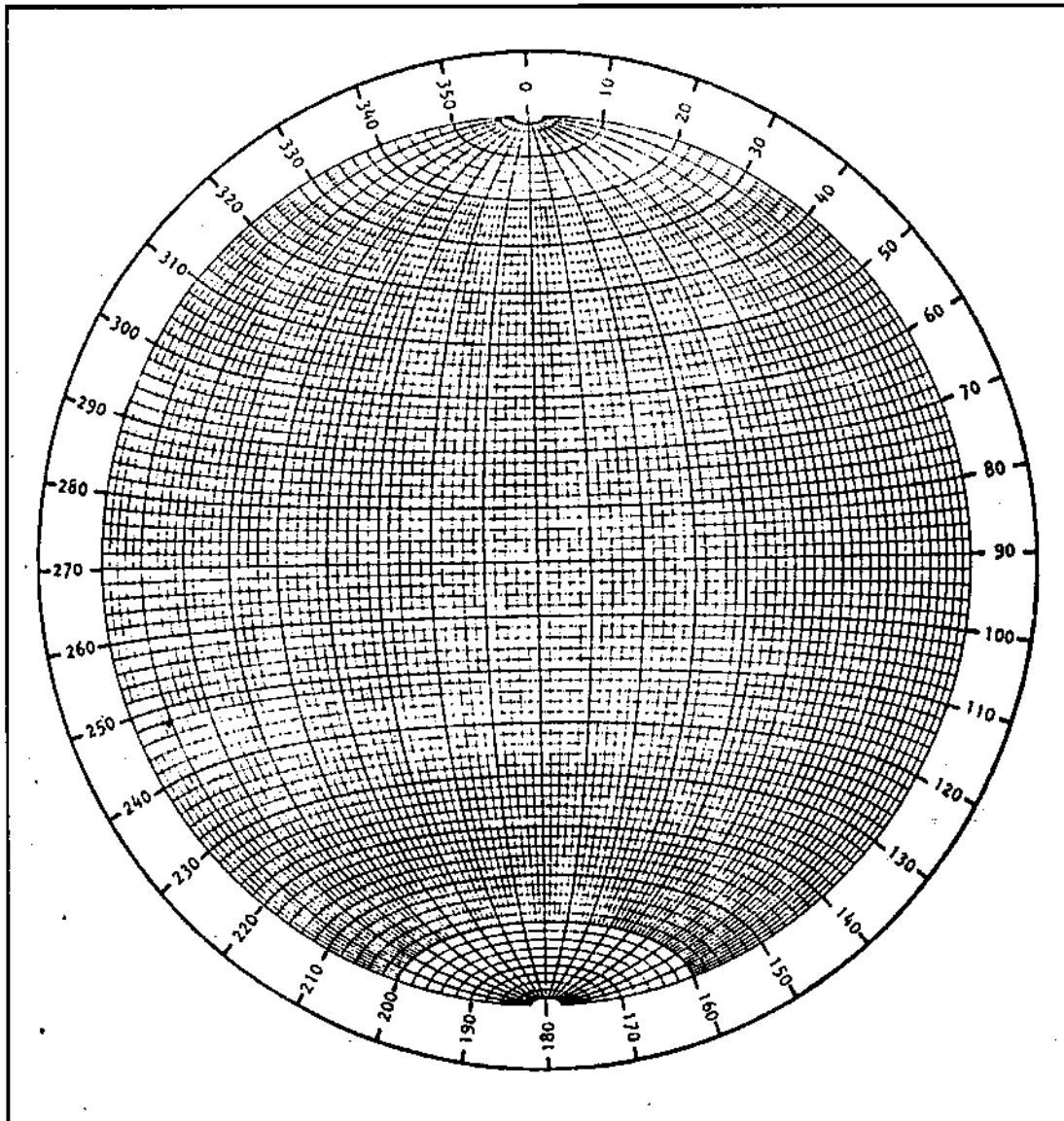


FIGURE Q1(c): Equatorial equal-area stereo-net marked in 2° intervals

PART B

- Q2** (a) Briefly describe how to use the distribution of modern and ancient animals (fossils) to support the theory of continental drift. (4 marks)
- (b) Briefly describe how oceanic plates vary in age as they proceed outward from a diverging mid-ocean ridge. (4 marks)
- (c) Draw simple sketches of divergent plate boundaries, three kinds of convergent plate boundaries, and transform plate boundaries. (6 marks)
- (d) Briefly discuss the engineering information that can be obtained from the rock coring. (6 marks)
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- Q3** (a) Briefly discuss the principle of seismic refraction techniques. (4 marks)
- (b) Briefly discuss the differences of soil profile produced by the seismic refraction and resistivity techniques. (6 marks)
- (c) Explain the differences of the results between:
- (i) Triaxial test and point load test
 - (ii) Uniaxial Compressive Strength (UCS) and Joint Surface Compressive Strength (JCS)
 - (iii) Brazilian test and Portable Ultrasonic Non-destructive Indicator test (6 marks)
- (d) Explain why the rebound hammer test is considered less accurate to obtain the rock strength. (4 marks)

Q4 (a) Describe **FOUR (4)** types of physical weathering with the aid of suitable diagrams.

(5 marks)

(b) Describe **FOUR (4)** types of chemical weathering with the aid of suitable diagrams.

(5 marks)

(c) Explain **FOUR (4)** factors that influencing the rates of weathering.

(5 marks)

(d) Explain why the types of sediments that formed at the upstream river are different from estuary environment.

(5 marks)

Q5 (a) Describe **THREE (3)** types of load carried by streams.

(4 marks)

(b) With the aid of suitable diagrams, explain the differences between:

- i) Fault and Fold
- ii) Anticline and Monocline
- iii) Strike slip fault and Normal dip slip fault

(6 marks)

(c) Describe **THREE (3)** types of stresses and geological structures formed as a result of these stresses.

(4 marks)

(d) Predict the textures and/or structures that could cause the weakness to civil engineering structures in (a) igneous rock, (b) sedimentary rock, and (c) metamorphic rock.

(6 marks)

- Q6** (a) Explain the differences between:
- i) Color and streak in mineral identification.
 - ii) Cleavage and fractured in mineral
 - iii) Granite and basalt in igneous rocks
- (6 marks)
- (b) Explain the differences of rock textures which exist in igneous, sedimentary and metamorphic rocks.
- (6 marks)
- (c) Explain how the foliated texture in metamorphic rock is formed.
- (2 marks)
- (d) With the aid of suitable diagrams, explain the differences between:
- i) Conglomerate and breccia in sedimentary rocks
 - ii) Clastic and chemical sedimentary rocks
 - iii) Foliation and lineation in metamorphic rocks
- (6 marks)

END OF QUESTIONS