UNIVERSITI SAINS MALAYSIA

Second Semester Examination
2009/2010 Academic Session

April/May 2010

# REG363 – Site Investigation
## *[Kajian Tapak]*

Duration: 3 hours
*[Masa: 3 jam]*

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Please check that this examination paper consists of SIX pages of printed material before you begin the examination.

*Sila pastikan bahawa kertas peperiksaan ini mengandungi ENAM muka surat yang tercetak sebelum anda memulakan peperiksaan ini.*

Students are allowed to answer all questions in English OR in Bahasa Malaysia.

*Pelajar dibenarkan menjawab semua soalan dalam Bahasa Inggeris ATAU Bahasa Malaysia.*

Answer **FIVE** questions only.

*Jawab **LIMA** soalan sahaja.*

In the event of any discrepancies, the English version shall be used.

*Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi Bahasa Inggeris hendaklah digunapakai.*

1. (a) What is the purpose of the site investigation?

*Apakah tujuan penyelidikan tapak?*

(5 marks/*markah*)

(b) Discuss and elaborate each of the ground investigation methods as listed below.

*Huraikan setiap satu kaedah-kaedah penyiasatan tanah seperti senarai di bawah.*

(i) Light dynamis penetometer/*Penusukan ringan dinamik*

(ii) Excavation/*Pengorekan*

(iii) Borehole/*Lubang gerek*

(15 marks/*markah*)

2. Describe in detail any **TWO** statements listed below. (Use sketches if needed).

*Jelaskan dengan terperinci **DUA** daripada perkara di bawah. (Gunakan lakaran jika perlu).*

(a) Compaction/*Pemadatan*

(b) Consolidation/*Pengukuhan*

(c) Sampling/*Persampelan*

(d) Slope stabilization/*Kestabilan cerun*

(e) Soil characteristic/*Ciri-ciri tanah*

(20 marks/*markah*)

3. (a) For a given soil, the following parameters have been determined in the soil laboratory:-

Specific gravity of soil solid particles, $G_s$ = 2.74, moist unit weight, $\gamma$ = 20.6 kN/m$^3$ and moisture content, w = 17.2%. Determine:-

(i) Dry unit weight of soil, $\gamma_{dry}$
(ii) Void ratio, e
(iii) Porosity, n
(iv) Degree of saturation, S

*Bagi satu sampel tanah, parameter berikut telah ditentukan daripada ujian makmal tanah:-*

*Graviti tentu butiran pejal tanah, $G_s$ = 2.74, berat unit lembap, $\gamma$ = 20.6 kN/m$^3$ dan kandungan lembapan, w = 17.2%. Tentukan:-*

(i) *Berat unit kering tanah, $\gamma_{dry}$*
(ii) *Nisbah lompang, e*
(iii) *Keliangan, n*
(iv) *Darjah ketepuan,S*

(10 marks/*markah*)

(b) For a saturated soil sample, it has been found that its moisture content, w = 21% and specific gravity of the soil solid particles, $G_s$ = 2.67. Determine:-

(i) Saturated unit weight, $\gamma_{sat}$
(ii) Dry unit weight, $\gamma_{dry}$
(iii) Moist unit weight of soil, $\gamma$ when degree of saturation becomes 70%

*Bagi satu sample tanah yang tepu, telah ditentukan bahawa kandungan lembapan tanah, w = 21% dan gravity tentu butiran pejal tanah, $G_s$ = 2.67. Tentukan.*

(i) *Berat unit tepu, $\gamma_{sat}$*
(ii) *Berat unit kering, $\gamma_{dry}$*
(iii) *Berat unit lembap tanah, $\gamma$ apabila darjah ketepuan tanah adalah 70%.*

(10 marks/*markah*)

4. (a) Describe about the shape of particles present in a soil mass and components of soil. What are the importance in site investigation.

*Huraikan tentang bentuk zarah-zarah dalam jisim tanah dan komponen-komponen tanah. Apakah kepentingannya dalam penyelidikan tapak.*

(7 marks/*markah*)

(b) Explain with the help of sketches on the principles of compaction and what is meant by the optimum moisture content at the maximum dry unit weight.

*Terangkan dengan bantuan gambarajah tentang prinsip-prinsip pemadatan dan apakah maksud kandungan kelembapan optimum pada berat unit kering maksimum.*

(7 marks/*markah*)

(c) Describe the method of dynamic compaction and what do you understand by cohesive and cohesion less soils.

*Huraikan kaedah pemadatan dinamik dan apakah yang anda faham tentang tanah berjeleket dan tanah tak berjeleket.*

(6 marks/*markah*)

5. (a) Explain the terms liquid limit, plastic limit, shrinkage limit, plasticity index and liquidity index and describe how they are measured.

*Terangkan maksud had cecair, had plastik, had pengecutan, indeks keplastikan dan indeks kecairan dan huraikan bagaimana ia dipertimbangkan.*

(10 marks/*markah*)

(b) The following results were obtained from a cone penetrometer test on a soil sample:-

*Keputusan ujian seperti berikut telah diperolehi daripada ujian penetrometer kon ke atas sampel tanah :*

| | | | | | |
|---|---|---|---|---|---|
| Cone penetration/ *Penelusan kon* (mm) | 15.5 | 17.3 | 19.6 | 22.4 | 23.9 |
| Moisture content/ *Kandungan lembapan* w (%) | 47 | 51 | 56 | 63 | 66 |

Find the liquid limit of the soil and also the plasticity index if the plastic limit was 18%. What is the classification of the soil.

*Dapatkan had cecair tanah dan juga indeks keplastikan jika had plastik ialah 18%. Apakah pengelasan tanah tersebut.*

(10 marks/*markah*)

6. Terzaghi's formula for the net ultimate bearing capacity $q_{nf}$ (total pressure less overburden pressure) for a continuous or strip footing is:-

*Formula Terzaghi's untuk keupayaan galas beban muktamad bersih* $q_{nf}$ *(tekanan keseluruhan kurang dari tekanan dibebankan) untuk asas jalur ialah:-*

$$q_{nf} = cN_c + \gamma z(N_q - 1) + 0.5\gamma BN_\gamma$$

Skempton's formula for $N_c$ for undrained saturated clay is:-

*Formula Skempton untuk* $N_c$ *untuk tanah liat tepu tidak mengalir ialah:-*

$$N_c = 5.14\,(1 + 0.2\,B/L)\,[1 + 0.053\,B/D]$$

The safe bearing pressure with a factor of safety $F$ is:-

*Tekanan galas selamat dengan faktor keselamatan F ialah:-*

$$q_s = q_{nf}/F + \gamma z$$

...6/-

For a certain soil the cohesion $C_u$ is 50 kN/m$^2$, the unit weight is 19.2 kN/m$^3$.

*Untuk tanah tertentu, kejeleketan ialah $C_u$ is 50 kN/m$^2$, berat unit ialah 19.2 kN/m$^3$.*

(a) Calculate the net ultimate bearing capacity for a continuous or strip footing of width $B$ = 1.25m, at a depth $z$ = 4.5m.

*Kirakan keupayaan galas beban muktamad bersih untuk asas jalur dengan lebarnya* $B$ = 1.25m, pada kedalaman $z$ = 4.5m.

(10 marks/*markah*)

(b) Considering shear failure only, calculate the safe total load on a footing 6 m long by 1.25m wide, using a load factor of 2.5.

*Hanya dengan mengambil kira kegagalan ricih, kirakan beban keseluruhan selamat ke atas asas 6m panjang dengan lebar 1.25m, gunakan faktor beban ialah 2.5.*

(10 marks/*markah*)

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