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UNIVERSITI SAINS MALAYSIA

Second Semester Examination  
Academic Session 2007/2008

April 2008

**REG 363 – Penyelidikan Tapak  
(Site Investigation)**

Masa: 3 jam  
(Duration: 3 hours)

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

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

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

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

Jawab **LIMA** soalan sahaja.

*Answer **FIVE** questions only.*

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1. (a) Dengan menggunakan carta, lakarkan kumpulan tanah.  
*Show by means of chart or diagrammatically the various soil groups.*
- (b) Terangkan ciri-ciri kejuruteraan tanah berbutir kasar, tanah berbutir halus, dan tanah organik.  
*Describe the engineering of course grain soil, fine grain soil and organic soil.*
- (20markah/marks)
2. Di dalam pengiraan ketumpatan tanah, ujian penggantian pasir telah dilakukan. 4.87 kg tanah telah dikeluarkan dari lubang permukaan tanah. Lubang tersebut kemudian dipenuhi dengan 3.56 kg pasir berpiawaian.  
*In order to measure the in situ density of soil, a sand replacement method was carried out. 4.87 kg of soil were extracted from a hole at the surface of the soil. The hole was then filled with 3.56 kg of loose dry standard sand.*
- (a) Jika diambil 6.58 kg pasir yang sama untuk memenuhi bekas 0.0042 m<sup>3</sup> isipadu. Kirakan ketumpatan tanah tersebut.  
*If it took 6.58 kg of the same sand to fill a container of 0.0042 m<sup>3</sup> in volume, determine the bulk density of the soil*
- (10 markah/marks)
- (b) Di dalam menentukan kandungan air, 24 g tanah yang diuji telah dikeringkan di dalam ketuhar pada suhu 105 darjah selsius. Berat tanah telah dikeringkan itu adalah 20 g. Kirakan peratusan kelembapan tanah tersebut.  
*In a water content determination, 24 g of the original soil was dried in an oven at 105 degrees C. The dried specimen weighed 20 g. Calculate the percentage of moisture.*
- (5 markah/marks)
- (c) Huraikan makna komponen 'lompong' di dalam mekanik tanah.  
*Describe the "void" components in a typical soil and its various possible states.*
- (5 markah/marks)

3. (a) Apakah yang dimaksudkan dengan pemadatan dan terangkan tujuan pemadatan di dalam mekanik tanah.

*What is the definition of compaction and explain what is its purpose in soil mechanics.*

(10 markah/marks)

- (b) Terangkan tatacara kerja alat duga mackintosh dilakukan di tapakbina.

*Explain the work procedure of mackintosh probe test at site.*

(10 markah/marks)

4. (a) Semasa kerja pembinaan penambakan tanah, ujian '**a sand-cone in-place soil unit weight**' telah dilakukan di lapangan. Data-data seperti berikut telah diperolehi:-

- (i) Berat pasir yang digunakan untuk isi ujian liang dan corong alat kon-pasir = 867 g.
- (ii) Berat pasir untuk isi corong = 319 g.
- (iii) Berat unit pasir = 1.57 g/cm<sup>3</sup>.
- (iv) Berat tanah basah daripada ujian liang = 747 g.
- (v) Kandungan kelembapan tanah daripada ujian liang yang ditentukan melalui alat **Speedy Moisture Tester** = 13.7%

Kirakan berat unit kering pemadatan tanah.

*During construction of soil embankment, a sand-cone in-place soil unit weight test was performed in the field. The following data were obtained:*

- (i) *Weight of sand used to fill test hole and funnel of sand-cone device = 867 g*
- (ii) *Weight of sand to fill funnel = 319 g*
- (iii) *Unit weight of sand = 1.57 g/cm<sup>3</sup>*
- (iv) *Weight of wet soil from the test hole = 747 g.*
- (v) *Moisture content of soil from test hole as determined by Speedy Moisture Tester = 13.7%*

*Calculate the dry unit weight of the compacted soil*

(10 markah/marks)

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- (b) Sampel tanah telah di ambil daripada cadangan kawasan yang dipotong dalam projek pembinaan lebuh raya dan telah dihantar ke makmal tanah untuk ujian pemadatan, dengan menggunakan prosedur pemadatan **Standard Proctor**. Keputusan ujian-ujian adalah seperti berikut :-

Berat unit kering maksima =  $1.79 \text{ g/cm}^3$   
 Kandungan kelembapan optima = 15.5%

Semasa kerja pembinaan penambakan tanah, pihak kontraktor telah melakukan seperti berikut :-

Berat unit kering yang telah dicapai dengan pemadatan tanah =  $1.72 \text{ g/cm}^3$   
 Kandungan air semasa = 16.0%

Tentukan peratusan pemadatan yang telah dilakukan oleh pihak kontraktor.

*A soil sample was taken from a proposed cut area in a highway construction project and sent to a soils laboratory for a compaction test, using the Standard Proctor compaction procedure. Result of the test are as follows:-*

*Maximum dry unit weight =  $1.79 \text{ g/cm}^3$   
 Optimum moisture content = 15.5%*

*The contractor, during construction of soil embankment, achieved the following:-*

*Dry unit weight reached by field compaction =  $1.72 \text{ g/cm}^3$   
 Actual water content = 16.0%*

*Determine the percent compaction achieved by the contractor.*

(10 markah/marks)

5. (a) Keputusan daripada satu analisis saiz partikel tanah adalah seperti berikut:

Peratusan yang melepasi saiz ayak No. 10 = 100  
Peratusan yang melepasi saiz ayak No. 40 = 80  
Peratusan yang melepasi saiz ayak No. 200 = 58

Had cecair (LL) ialah 30 dan indek plastik (PI) ialah 10. Kelaskan tanah menggunakan sistem pengelasan AASHTO dan gunakan **Jadual 1.0**.

*The result of the particle-size analysis of a soil are as follows:*

*Percent passing through the No. 10 sieve = 100  
Percent passing through the No. 40 sieve = 80  
Percent passing through the No. 200 sieve = 58*

*The liquid limit (LL) of 30 and plasticity index (PI) of 10. Classify the soil by the AASHTO classification system and using **Table 1.0**.*

(10 markah/marks)

- (b) 95% partikel tanah melepasi saiz ayak no. 200 dan had cecair (LL) ialah 60 dan indek plastik ialah 40. Kelaskan tanah menggunakan sistem pengelasan AASHTO

*95% of a soil passes through the No. 200 sieve and has a liquid limit (LL) of 60 and plasticity index (PI) of 40. Classify the soil by the AASHTO classification system.*

(10 markah/marks)

**JADUAL 1.0/TABLE 1.0**

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**Classification of Soils and Soil-Aggregate Mixtures by AASHTO Classification System [5]**

General Classification	Granular Materials (35% or less passing 0.075 mm)							Silt-Clay Materials (more than 35% passing 0.075 mm)			
	A-1		A-3	A-2				A-4	A-5	A-6	A-7
Group Classification	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6
Sieve analysis: Percent passing:											
2.00 mm (No. 10)	50 max.	—	—	—	—	—	—	—	—	—	—
0.425 mm (No. 40)	30 max.	50 max.	51 min.	—	—	—	—	—	—	—	—
0.075 mm (No. 200)	15 max.	25 max.	10 max.	35 max.	35 max.	35 max.	35 max.	36 min.	36 min.	36 min.	36 min.
Characteristics of fraction passing 0.425 mm (No. 40):											
Liquid limit	—	—	40 max.	41 min.	40 max.	41 min.	40 max.	41 min.	40 max.	41 min.	41 min.
Plasticity index	6 max.	NP	10 max.	10 max.	11 min.	11 min.	10 max.	10 max.	11 min.	11 min. <sup>1</sup>	
Usual types of significant constituent materials	Stone fragments, gravel, and sand		Fine sand	Silty or clayey gravel and sand				Silty soils		Clayey soils	
General ratings as sub-grade	Excellent to good					Fair to poor					

<sup>1</sup> Plasticity index of A-7-5 subgroup is equal to or less than *LL* minus 30. Plasticity index of A-7-6 subgroup is greater than *LL* minus 30.