

SULIT



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**PEPERIKSAAN AKHIR
SEMESTER I
SESI 2010/2011**

NAMA KURSUS	:	MEKANIK TANAH
KOD KURSUS	:	BBT 3432
PROGRAM	:	SARJANA MUDA PENDIDIKAN TEKNIK DAN VOKASIONAL
TARIKH PEPERIKSAAN	:	NOVEMBER / DISEMBER 2010
JANGKA MASA	:	2 JAM
ARAHAN	:	JAWAB EMPAT SOALAN SAHAJA

KERTAS SOALAN INI MENGANDUNGI 9 MUKA SURAT

SULIT

- S1 (a) Tanah merupakan endapan longgar yang wujud melalui proses luluhawa. Terangkan bagaimana proses luluhawa ini menyumbang kepada peningkatan ekonomi dari aspek pertanian.
Soil is loose sediment that exists through the weathering process. Explain how weathering process contributed to the improvement of the economic aspects of agriculture.

(7 markah)
 (7 marks)

- (b) Satu sampel tanah mempunyai ketumpatan gembur 1910 kg/m³ dan kandungan air 9.5%. Nilai G_s ialah 2.70.
A sample of soil has a bulk density of 1910kg/m³ and the water content of 9.5%. G_s value is 2.70.

- i) Kira nisbah lompong dan darjah ketepuan tanah.
Calculate the void ratio and degree of saturation.
- ii) Tentukan nilai ketumpatan gembur dan kandungan air sekiranya tanah di dalam keadaan tepu penuh dengan nisbah lompong yang sama?
Determine the bulk density and water content of soil if the soil was fully saturated with the same void ratio?

(18 markah)
 (18 marks)

- S2 (a) Berikan definisi :
 (i) Pekali Kelengkungan (ii) Pekali Keseragaman
Define:

- (i) *Coefficient of Curvature* (ii) *Coefficient of Uniformity*

(4 markah)
 (4 marks)

- (b) Keputusan analisis ayakan bagi dua contoh tanah ditunjukkan dalam Jadual S2. Kelaskan sample tanah dengan menggunakan AASHTO dan USCS.

Sieve analysis results of two soil sample are shown in Table S2. Classify the soil sample using AASHTO and USCS.

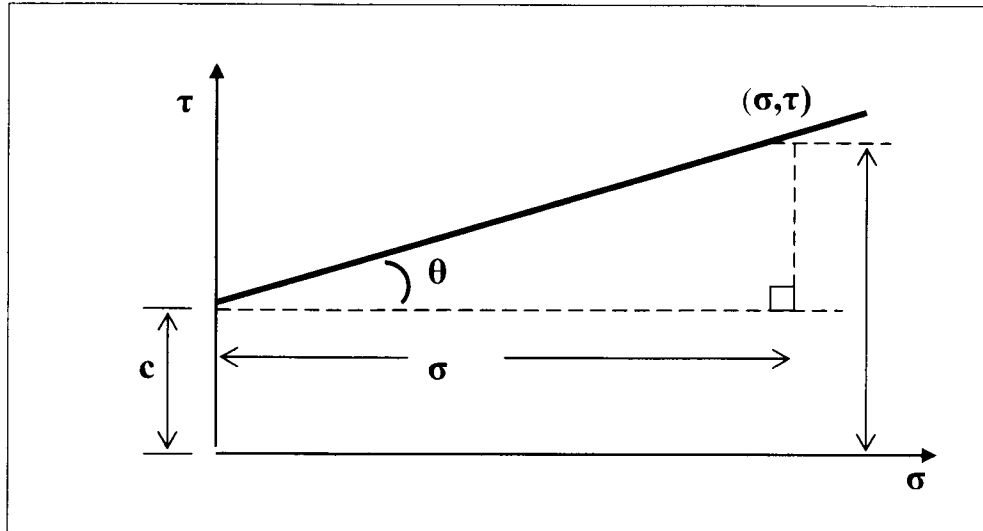
Jadual/Table S2

Soil Sample		Given; L.L = 55 % P.L = 20 %
Sieve No	% Passing	
10	94.0	
40	91.0	
200	51.0	

(21 markah)
 (21 marks)

- S3 (a) Berpandukan kepada Rajah S3, buktikan;
Referring to Figure S3, prove;

$$\tau = c + \sigma \tan \theta$$



Rajah/Figure S3

(5 markah)

(5 marks)

- (b) Jadual S3 di bawah merujuk kepada ujian tiga paksi bagi satu contoh tanah yang tidak terganggu. Faktor kaliberasi beban dail bagi satu bahagian ialah 1.2 N. Setiap sampel tanah ialah 65mm panjang dan 37.0 mm diameter. Dapatkan nilai-nilai bagi kejelekitan dan sudut geseran dalam bagi tanah ini.

Table S3 show the data of tri-axial tests for undisturbed soil sample. Load dial calibration factor 1.2 N per division. Each soil sample was 65 mm in length and 37.0 mm in diameter. Find the values of apparent cohesion and the angle of internal friction for this soil.

Jadual/Table S3

Ujian Tiga Paksi	Cell Pressure, (kN/m ²)	Axial Load Dial Reading Division at Failure
U1	50	66
U2	150	106
U3	250	147

(20 markah)

(20 marks)

- S4 (a) Berikan faktor-faktor yang mempengaruhi pekali kebolehtelapan tanah.
Give the factors affecting coefficient of permeability of soil. (6 markah)
(6 marks)
- (b) Satu ujikaji telah dijalankan dalam makmal menggunakan turus tekanan tetap pada sampel tanah berpasir. Panjang sampel 250mm dan luas 2000mm². Kehilangan turus adalah 500mm dan kadar alir ialah 250ml dalam masa 120 saat. Tentukan pekali kebolehtelapan tanah tersebut.
A test was carried out in a laboratory by using a constant head permeameter on a sandy soil. The length of the sample was 250mm and 2000mm² in area. With a head lost of 500mm, the discharge was found to be 250ml in 120seconds. Determine the permeability coefficient of the soil. (9 markah)
(9 marks)
- (c) Jika graviti tentu bagi zarah tanah itu ialah 2.62 dan jisim kering tanah ialah 900g, tentukan nilai bagi liang tanah tersebut.
If the specific gravity of the grains was 2.62 and the dry weight of the soil is 900g, find the void ratio of the sample. (10 markah)
(10 marks)
- S5 (a) Huraikan dengan jelas lima faktor yang menyumbang kepada hakisan tanah.
Briefly describe the five factors that contribute to soil erosion. (12 markah)
(12 marks)
- (b) Satu projek perumahan akan dibina di kawasan tanah tinggi yang melibatkan kerja-kerja pemotongan dan penambakan tanah. Dengan berbantuan rajah huraikan bagaimana dua kaedah penstabilan cerun dapat memberi kesan kepada kestabilan struktur tanah.
A housing project will be constructed in highland areas involving the work of cutting and land reclamation. With a suitable diagrams, explain how the two methods of slope stabilization will affect the stability of soil structure. (13 markah)
(13 marks)

S6 Jadual S6 di bawah menunjukkan data yang diperolehi hasil ujian piawai pepadatan *proctor*.

Table S6 below shows the results of Standard Proctor Compaction Test.

Diberi;

Given

Isipadu acuan <i>Mould Volume</i>	=	$8.433 \times 10^{-4} \text{ m}^3$
Jisim acuan <i>Weight of Mould</i>	=	4.10 kg
Graviti tentu, G_s <i>Specific Gravity</i>	=	2.65

Jadual/Table S6

Soil Samples	Weight of Sample + Mould	Weight of soil samples (g)	Weight of dry samples (g)
1	5.37	15.2	13.9
2	5.47	17.0	15.0
3	5.43	20.5	17.5
4	5.15	20.0	16.7

- (a) Berikan nilai-nilai ketumpatan kering maksimum dan kandungan lembapan optimum.
Give the values of maximum dry density and optimum moisture content.
- (b) Berpandukan kiraan, berikan kenyataan tahap ketepuan tanah semasa pepadatan maksima.
Based on calculations, give a brief review of the saturation level during the maximum compaction.
- (c) Berapakah peratus pepadatan tanah untuk kandungan lembapan 12%?
What is the percentage of soil compaction of 12 % moisture content?

(25 markah)

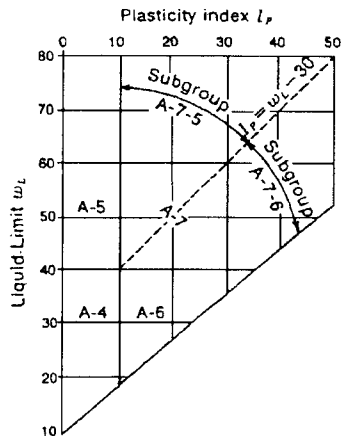
(25 marks)

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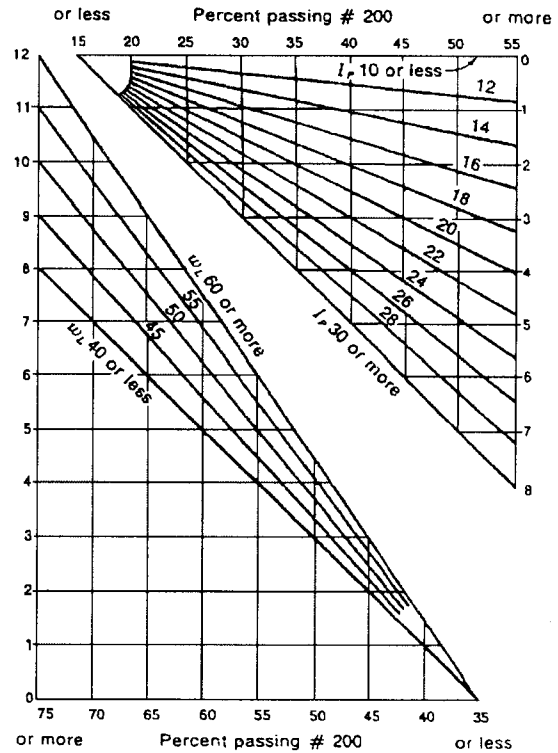
General classification	Granular materials (35 percent or less of total sample passing no. 200)							Silt-clay Materials (More than 35 percent of total sample passing no. 200)				
	A-1		A-3	A-2			A-4	A-5	A-6	A-7		
Group classification	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5* A-7-6	
Sieve analysis percent passing												
# 10	50 max											
# 40	30 max	50 max	51 min									
# 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 # 40												
Liquid limit, w_L				40 max	41 min	40 max	41 min	40 max	41 min	40 max	41 min	
Plastic Index, I_p	6 max		NP	10 max	10 max	11 min	11 min	10 max	10 max	11 min	11 min	
Group index	0		0	0			4 max		8 max	12 max	16 max	20 max

$$\text{Group index} = GI = 0.2a + 0.005ac + 0.01bd$$

(a) AASHTO soil classification system.



(b) Liquid limit and plasticity index ranges for A-4, A-5, A-6, and A-7 soil groups



(c) Chart to obtain group index of a soil

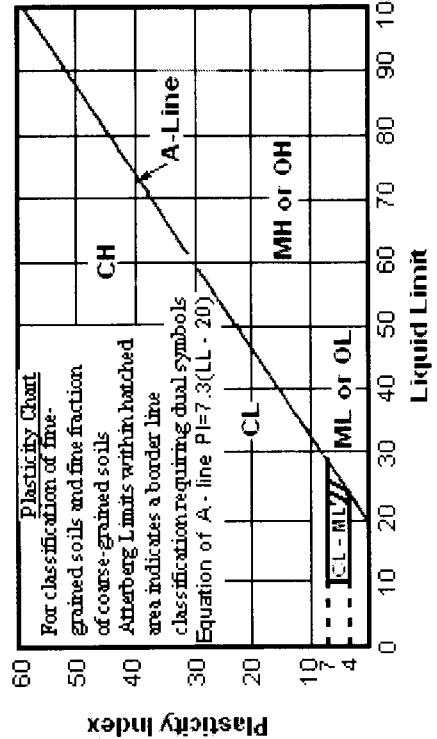
$$G.I. = \underbrace{(F - 35)}_a \left[0.2 + 0.005 \underbrace{(L.L. - 40)}_b \right] + 0.01 \underbrace{(F - 15)}_c \underbrace{(P.I. - 10)}_d$$

American Association of State Highway and Traffic Official (AASHTO)
(Persatuan Jalanraya dan Lalulintas Negeri-negeri Amerika Syarikat)

TABLE 4-5 APPROXIMATE EQUIVALENT GROUPS OF AASHTO AND UNIFIED SOIL CLASSIFICATION SYSTEMS	
AASHTO	Unified
A-2-6	GC, SC
A-2-7	GC, SC
A-3	SP
A-4	ML, OL
A-5	MH
A-6	CL
A-7-5	CL, OL
A-7-6	CH, OH

American Association of State Highway and Traffic Official (AASHTO)
(Persatuan Jalanraya dan Lalulintas Negeri-negeri Amerika Syarikat)

MAJOR DIVISION		GROUP SYMBOLS	TYPICAL NAMES	CLASSIFICATION CRITERIA	
COARSE-GRAINED SOILS	GRAVELS 50% or more of coarse fraction retained on 4.75 mm (No. 4) sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	$C_u = D_{60}/D_{10}$ — Greater than 4 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ — Between 1 and 3
			GP	Poorly graded gravels and gravel-sands mixture, little or no fines	
		GRAVELS WITH FINES	GM	Silty gravels, gravel-sands - silt mixture	Not meeting both criteria for GW Atterberg limit plot below "A" line or Plasticity Index less than 4 Atterberg limit plot above "A" line and Plasticity Index greater than 7
			GC	Clayey gravels, gravel-sands-clay mixture	
	SANDS More than 50% of coarse fraction passes 4.75 mm (No. 4) sieve	CLEAN SANDS	SW	Well-graded sands and gravelly sands, little or no fines	$C_u = D_{60}/D_{10}$ — Greater than 6 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ — Between 1 and 3
			SP	Poorly graded sands and gravelly sands, little or no fines	
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures	Not meeting both criteria for SW Atterberg limit plot below "A" line or Plasticity Index less than 4 Atterberg limit plot above "A" line and Plasticity Index greater than 7
			SC	Clayey sands, sand-clay mixture	
	FINE-GRAINED SOILS 50% or more passing 0.075 mm (No. 200) sieve	Liquid Limit 50% or less	MIL	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
OL			Organic silts and organic silty clays of low plasticity		
Liquid Limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols	
		CH	Inorganic clays of high plasticity, fat clays		
		OH	Organic clays of medium to high plasticity		
Highly Organic Soils	PT	Peat, muck and other highly organic soils			



Unified Soil Classification System (USCS)
(Sistem Pengkelasan Tanah Bersekutu)

Nama No. Matrik :

TABURAN SAIZ ZARAH															
Jumlah Peratus Lulus (%)	HYDROMETER						AYAKAN								
	KELODAK			PASIR			KELIR								
	HALUS	SEDERHANA	KASAR	HALUS	SEDERHANA	KASAR	HALUS	SEDERHANA	KASAR	SEDERHANA	KASAR				
100															
90															
80															
70															
60															
50															
40															
30															
20															
10															
0															
	0.001	0.002	0.006	0.01	0.02	0.06	0.1	0.2	0.6	1	2	6	10	20	60