Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2017/2018

COURSE NAME	:	SOIL MECHANICS
COURSE CODE	:	BPD 20502
PROGRAMME CODE	:	BPC
EXAMINATION DATE	:	DECEMBER 2017/JANUARY 2018
DURATION	:	2 HOURS
INSTRUCTION	:	A) ANSWER **ALL** QUESTIONS
		B) SUBMIT **APPENDIX II** WITH YOUR ANSWER SCRIPT

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 (a) During construction, several techniques can be applied to improve soil condition.

Discuss **THREE (3)** soil improvement techniques commonly applied in construction industry together with their complete procedures.

(9 marks)

(b) **Figure Q1(a)** in **Appendix I** shows a rectangular foundation with dimension 2.5m placed 2.2m below the surface of a strong cohesive soil.

Calculate items below with reference to **Figure Q1(a)** and **Figure Q1(b)** in **Appendix I**.

(i) Ultimate bearing capacity

(8 marks)

(ii) Permitted load on load-bearing wall with safety factor, FS=3.

(8 marks)

Q2 Clay samples collected from 5 metres deep in Batu Pahat has a unit weight (ϒ) of 18 kN/m^3. The following data in Table Q2 were recorded during an oedometer test of the sample.

Table Q2: Oedometer test data

Effective stress (kN/m^2)	25	50	100	200	400	800	200	50
Void ratio (e)	0.85	0.82	0.71	0.57	0.43	0.3	0.4	0.5

(a) Plot the graph of void ratio against effective stress on the given semi-log graph in **Appendix II**.

(5 marks)

(b) Calculate items below using the given equations as in **Appendix III**.

(i) Compression index (C_c)

(5 marks)

(ii) Preconsolidation pressure (P_c)

(5 marks)

(iii) Coefficient of volume compressibility (m_v)

(5 marks)

(c) Calculate whether the soil is normally consolidated or over consolidated.

(5 marks)

Q3 (a) Prior construction, soil investigation need to be performed in order to collect important information on engineering properties of the soil.

Explain other purposes of soil investigation.

(5 marks)

(b) Shear failure in soil occurs when the shear stresses are large enough to make the particles roll and slide past each other.

Discuss the requirements to assess shear strength in construction industry.

(10 marks)

(c) Permeability is a measurement to show how easy the water flows through the soil.

Determine factors affecting the coefficient of permeability (k).

(10 marks)

Q4 A pile is a long slender stiff structural member which is used to transfer loads from surface structure to a certain depth in the ground.

Explain through examples **FIVE (5)** conditions where pile foundation are required.

(25 marks)

- END OF QUESTIONS -

APPENDIX I

FINAL EXAMINATION

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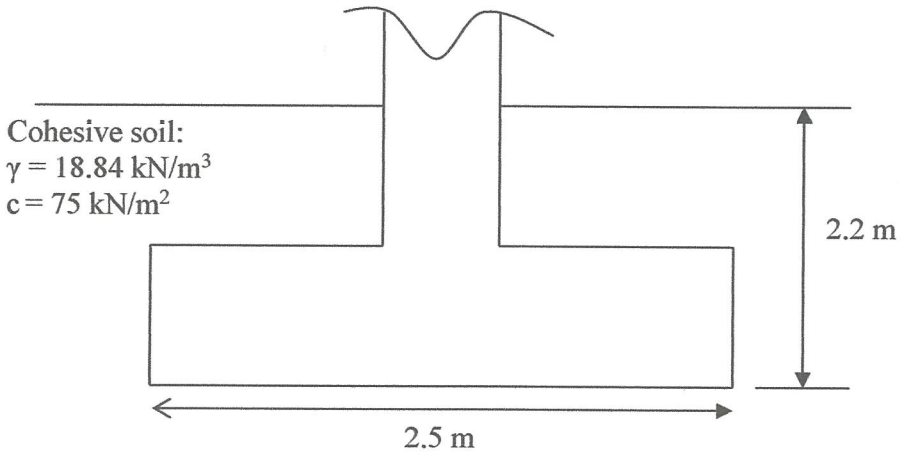


Figure Q1(a)

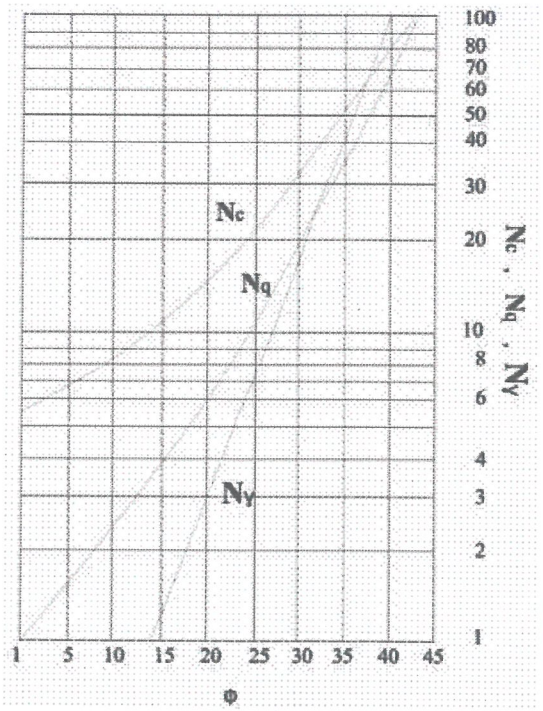


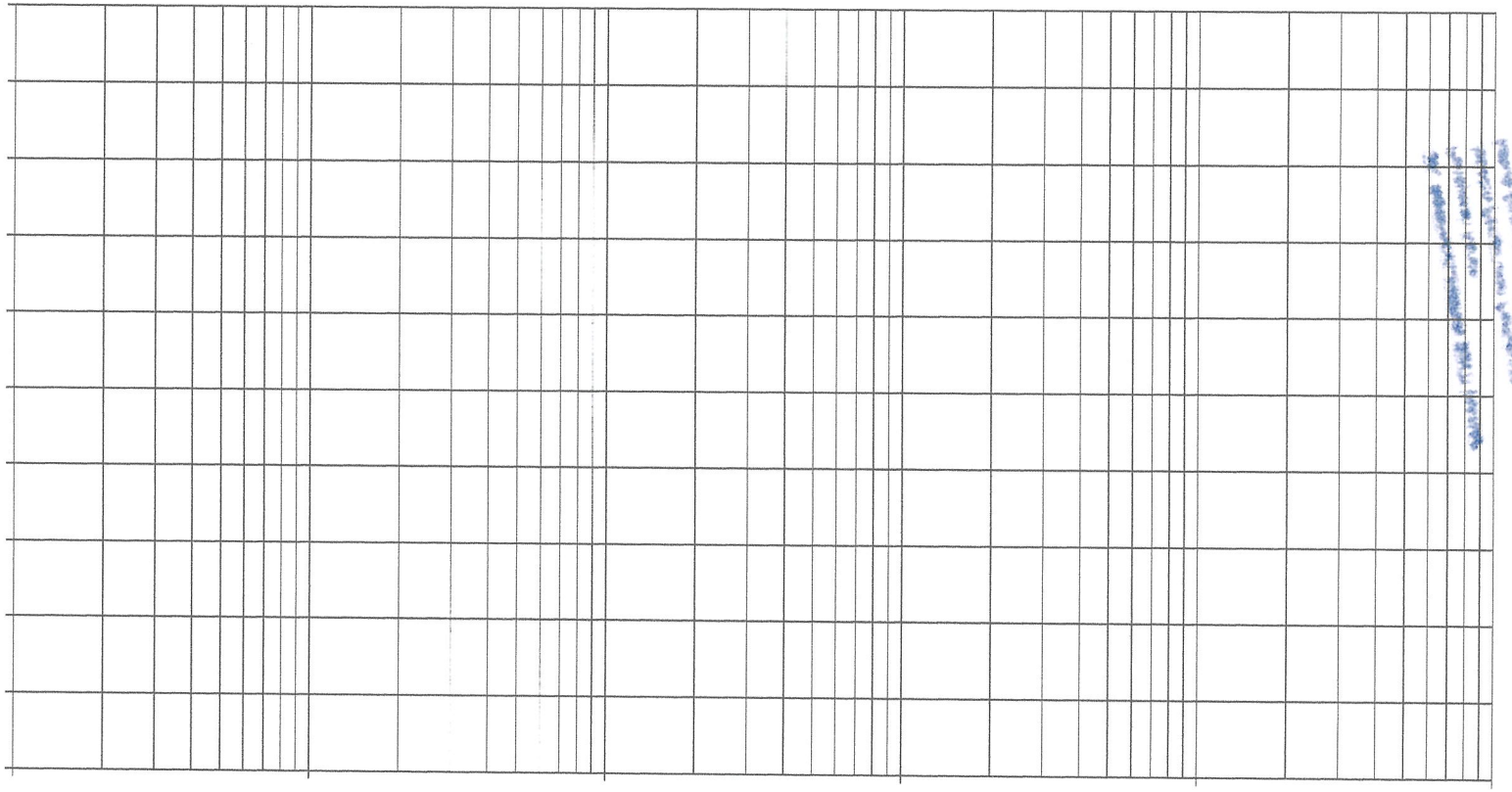
Figure Q1(b)

APPENDIX II

FINAL EXAMINATION

NAME :
SEMESTER / SESSION : SEM I / 2017/2018
COURSE NAME : SOIL MECHANICS

MATRIX NO. :
PROGRAMME CODE : BPC
COURSE CODE : BPD 20502



APPENDIX III

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Equation for m_v:

$$m_v = \frac{\Delta e}{\Delta \sigma'} \quad \frac{1}{1+e_{avg}}$$

Where, $e_{avg} = \frac{e_1 + e_2}{2}$

$$\text{Gradient of the curve} = \frac{\Delta e}{\Delta \sigma'}$$

Therefore, m_v = Gradient of the curve X $\left[\frac{1}{1 + \left[\frac{e_1 + e_2}{2} \right]} \right]$

Equation for C_c:

$$C_c = \frac{e_1 - e_2}{\sigma'_1 - \sigma'_2}$$

Equation for σ'_o:

$$\sigma'_o = \frac{(\gamma sat - \gamma w)\, H}{2}$$