UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2015/2016

COURSE NAME : SOIL MECHANICS

COURSE CODE : BPD 20502

PROGRAMME : 2 BPC

EXAMINATION DATE : DECEMBER 2015/JANUARY 2016

DURATION : 2 HOURS

INSTRUCTION : A) ANSWER **ALL** QUESTIONS

B) SUBMIT APPENDIX I(B) AND APPENDIX I(C) WITH YOUR ANSWER SCRIPT

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

BPD 20502

Q1 According to Darcy's Law, permeability is defined as the ability of water to flow through fully saturated soils and the coefficient of permeability (k) is influenced by several important factors.

(a) State the equation of Darcy's Law to calculate the flow rate (q).

(5 marks)

(b) Discuss the related factors that influence the coefficient of permeability (k).

(20 marks)

Q2 Soils are stable if the stress level is maintained or water content remains constant. However, when stresses applied in soil mass are changed, it deforms and causes settlement and consolidation in some instances.

(a) Define settlement and consolidation.

(5 marks)

(b) Differentiate between Casagrande method and Taylor method using information as provided in Appendix I.

(20 marks)

Q3 Well-designed pile foundations are required to safely transfer loads from buildings to the soil without failure.

(a) State the classifications of pile foundation.

(5 marks)

(b) Discuss **FOUR (4)** characteristics of soil that requires the use of pile foundation.

(20 marks)

Q4 Knowledge on lateral earth pressure is important to design structures including retaining walls.

(a) State the types of retaining wall commonly used in Malaysia's scenario.

(5 marks)

(b) Analyse **TWO (2)** cases that is in relation to failure of retaining walls.

(20 marks)

- END OF QUESTIONS –

BPD 20502

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Sample information:

Sample no: 1A
Location: Batu Pahat, Johor, Malaysia
Coordinate: 1.8500° N, 102.9300° E
Depth: 5 meter
Type of soil: Clay
Unit weight: 18 kN/m^3
Oedometer test result:

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

TABLE Q2(b): Sample information

FINAL EXAMINATION

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FIGURE Q2(b): Semi-log graph

4

BPD 20502

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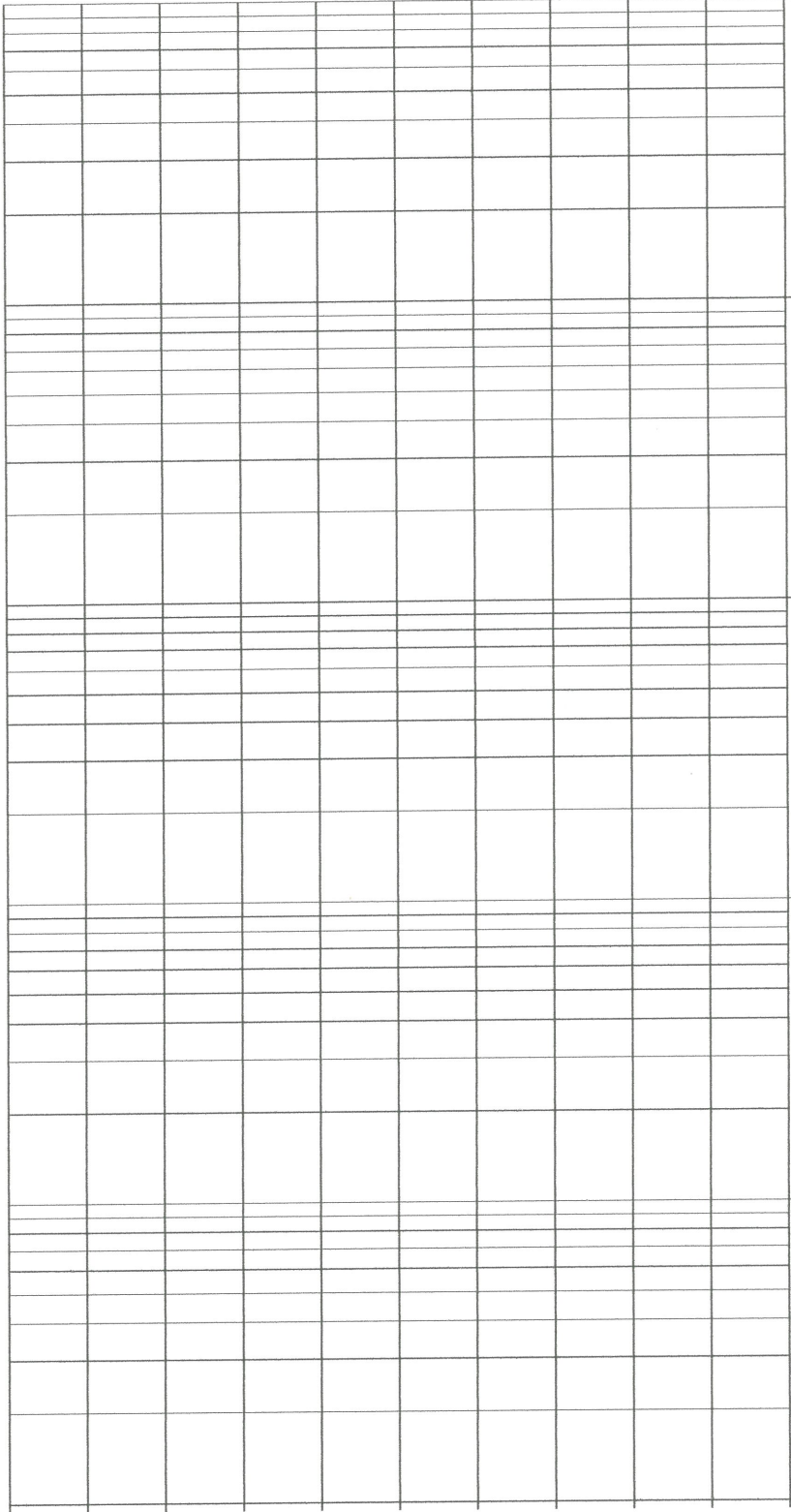
FIGURE Q2(b): Graph

5

FINAL EXAMINATION	
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Equation for m_v:

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

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

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

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

Equation for C_c:

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

Equation for σ'_o:

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