Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2023/2024

COURSE NAME	:	SOIL MECHANICS
COURSE CODE	:	BPD 14402
PROGRAMME CODE	:	BPC
EXAMINATION DATE	:	JULY 2024
DURATION	:	2 HOURS
INSTRUCTION	:	1.ANSWER ALL QUESTIONS 2.THIS FINAL EXAMINATION IS CONDUCTED VIA ☐ Open book ☒ Closed book 3.STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF SEVEN (7) PAGES

Q1 Disturbed and undisturbed soil samples are collected through many sampling methods including test pits, thin walled sampler, Mazier sampler, soil penetration test, and cone penetration test.

(a) Explain **FIVE (5)** purposes requiring the collection of disturbed and undisturbed soil samples.

(10 marks)

(b) Outline **FOUR (4)** types of soil boring.

(15 marks)

Q2 Soils are stable if the stress level is maintained or water content remains constant. However, when the stress applied to the soil mass has increased, it deforms and causes settlement.

(a) Define:

(i) Settlement.

(ii) Consolidation.

(5 marks)

(b) Differentiate between Casagrande Method and Taylor Method using sample information as in **Table** in **APPENDIX A.1, Figure** as in **APPENDIX B.1** and **Figure** as in **APPENDIX C.1.** Please refer formula as given in **APPENDIX D.**

(20 marks)

Q3 Compaction is a process to increase the density of the soil by which the solid particles are packed more closely together and lessen the air voids without critical changes to the soil water volume.

(a) Define Optimum Moisture Content (w_{opt}).

(5 marks)

(b) Differentiate between Proctor test and AASHTO modified test.

(10 marks)

(c) Describe the principles and methods involved in soil compaction.

(10 marks)

Q4 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) Describe **FIVE (5)** related factors that influence the coefficient of permeability (k).

(10 marks)

(c) Discuss **TWO (2)** in-situ tests to determine the coefficient of permeability (k).

(10 marks)

- END OF QUESTIONS –

APPENDIX A

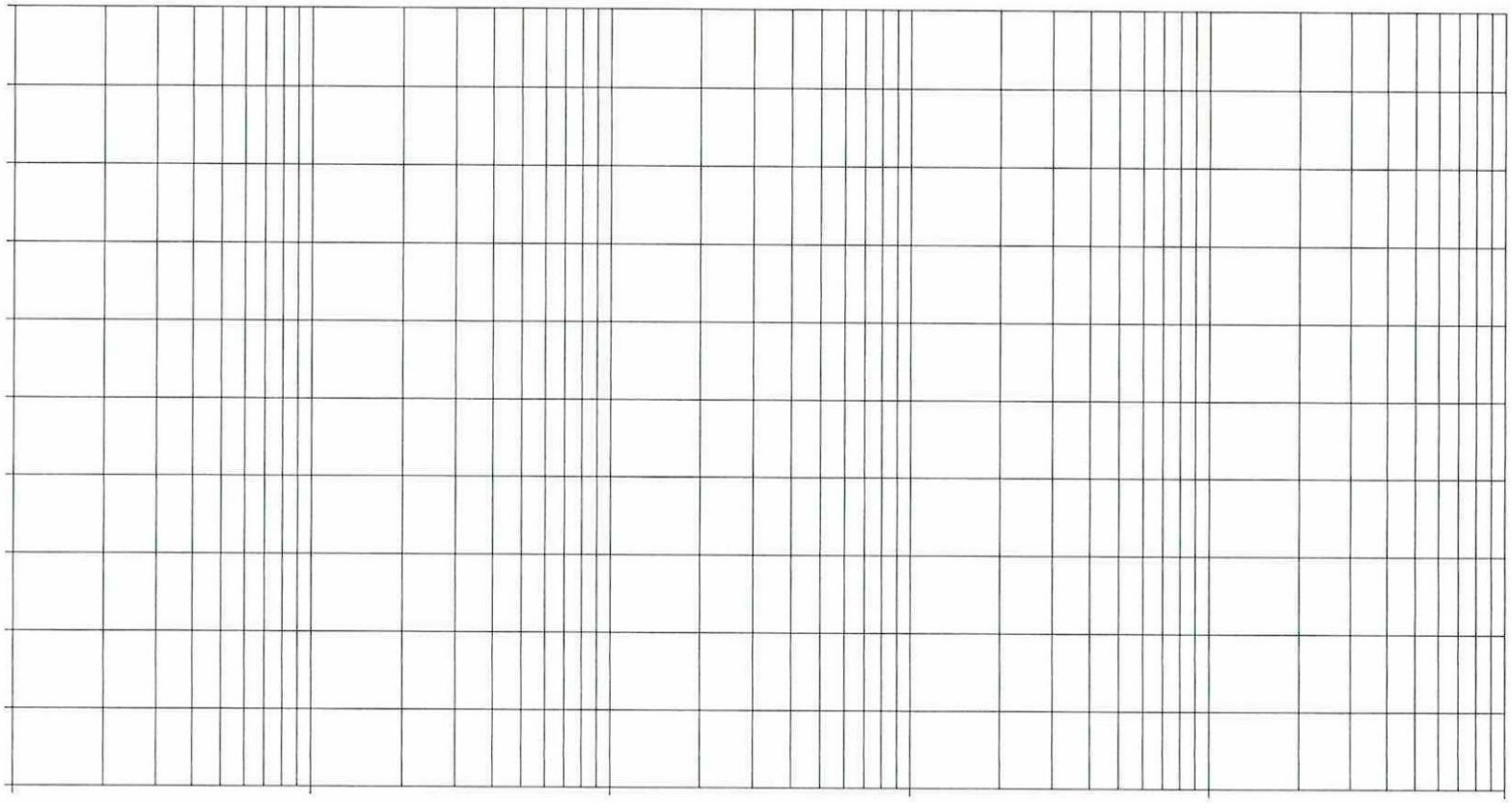
Sample information:

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

Table APPENDIX A.1 Oedometer test result

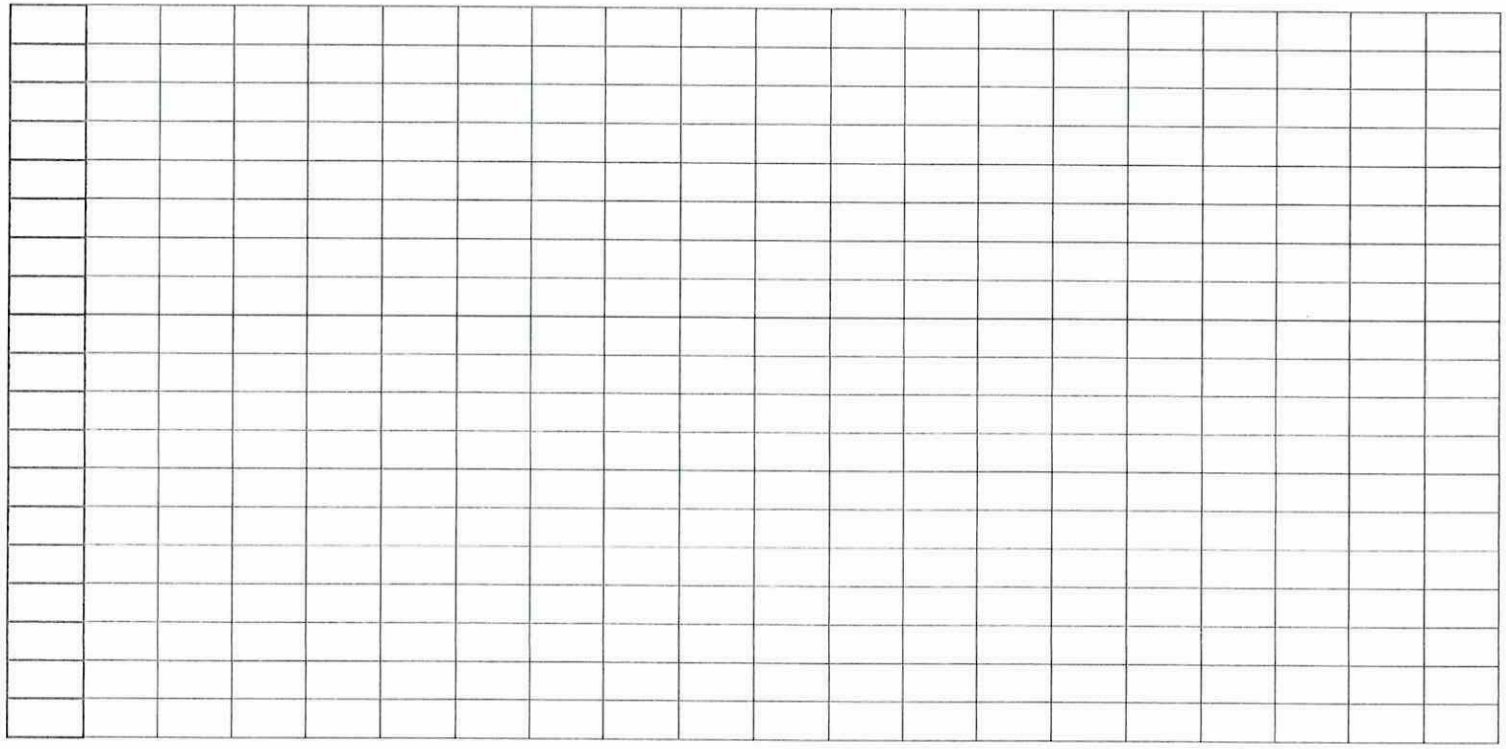
Effective stress (kN/m^2)	25	50	100	200	400	800	200	50
Void ratio (e)	0.85	0.82	0.71	0.57	0.43	0.3	0.4	0.5

APPENDIX B



APPENDIX B.1 Semi log graph

APPENDIX C



APPENDIX C.1 Graph

APPENDIX D

Equation for m_v:

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

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

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:

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