KSCP Examination
2020/2021 Academic Session

September 2021

EAG245 – Soil Mechanics

Duration : 2 hours

Please ensure that this examination paper contains **SEVEN (7)** printed pages before you begin the examination.

Instructions: This paper contains **FOUR (4)** questions. Answer **ALL** questions.

All questions **MUST BE** answered on a new page.

1. (a). A soil sample for a new development of Hospital Parit Buntar was collected for laboratory tests. The soil sample has a wet mass of 5.1 kg, bulk density of 1.63 g/cm^3, dry density of 1220 kg/m^3 and degree of saturation of 78%. From the information given;

i) Draw the 3-phase diagram of the unsaturated soil sample by deriving the weight-volume relationships equations for each soil phase (Assumed V_S = 1).

[7 marks]

ii) Determine the density of solids.

[7 marks]

iii) Describe the main difference between the dry density and density of solids and give a typical range of values for both.

[6 marks]

iv) Explain why high plasticity soil can retain so much water compared to coarse-grained soil.

[5 marks]

2. (a). Two different soils obtained from different sites are used to determine the soil types. Using the information given in **Table 1;**

i) Draw the particle sizes distribution curves for each soil type. Use the given semilog graph paper.

[8 marks]

ii) Estimate the soil types, based on the particle's sizes distribution curves and the percentage of each soil fraction.

[4 marks)

iii) As an engineer involved in both sites, examine which soil type will cause soil settlement and justify your main reasons.

[4 marks]

Table 1

Sieve Size (mm)	Percentage Passing (%) Soil A	Percentage Passing (%) Soil B
4.75	81	100
2.36	75	99
1.18	70	98
0.6	63	96
0.425	58	94
0.3	52	91
0.15	43	88
0.075	35	83
0.02	24	80
0.006	17	76
0.002	12	73

…4/-

(b). In **Figure 1**, a platform with a pile will be built at the Putrajaya Lakeside. Given that the thickness of the clay is 6 m and the average depth of the water level in the lake is at 4 m. If the saturated unit weight of the clay is18 kN/m^3, calculate and plot the total stress, effective stress, and the pore water pressure at points A and B.

[9 marks]

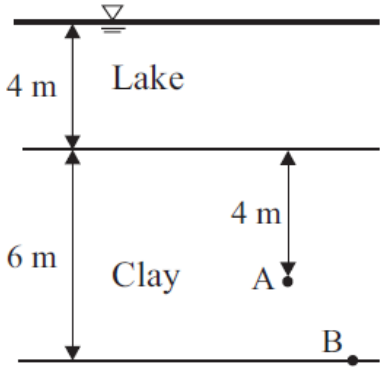

Figure 1

3. Compaction of soil is a standard practice performed prior to the start of construction. In a 10-acres area, compaction works is being done for a quarantine centre project. The results of the standard compaction test for the sample taken from the site before earthwork are shown in **Table 2**.

(a). Based on the results of a standard compaction test given in **Table 2:**

i) Explain **TWO (2)** consequences of improper soil compaction to the quarantine centre construction project.

[8 marks]

ii) Determine the maximum dry density and optimum moisture content at 95% standard compaction.

[12 marks]

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iii) With the help of a sketch, explain **ONE (1)** method of validating that the dry unit weight at the site has already reached 95% standard compaction.

[5 marks]

Table 2

Bulk Unit Weight (kN/m^3)	15.0	16.5	18.5	18.5	18.0
Water Content (%)	10.0	12.5	15.0	17.5	20.0

4. (a) List **THREE (3)** main parameters for consolidation and describe the techniques used to obtain each parameter. Use sketches and diagrams to support your explanation.

[6 marks]

(b) A site for the construction of a housing project in Nibong Tebal needs an embankment backfill to produce a safety level from the flood during heavy rainfall. The initial condition before construction of the embankment is as shown in **Figure 2**. The water table is found to be 6 m below ground level. Additional stress to a clay layer due to the construction of the embankment is estimated to be around 80 kN/m^2. The thickness of the clay layer is 6 m and being overlaid and underlaid by a sandy layer. With the help of Appendix A, determine:

i) The total settlement of the clay layer consolidation as a result of embankment construction

[5 marks]

ii) Estimate the time taken to achieve 50%, 75% and 90% consolidation

[9 marks]

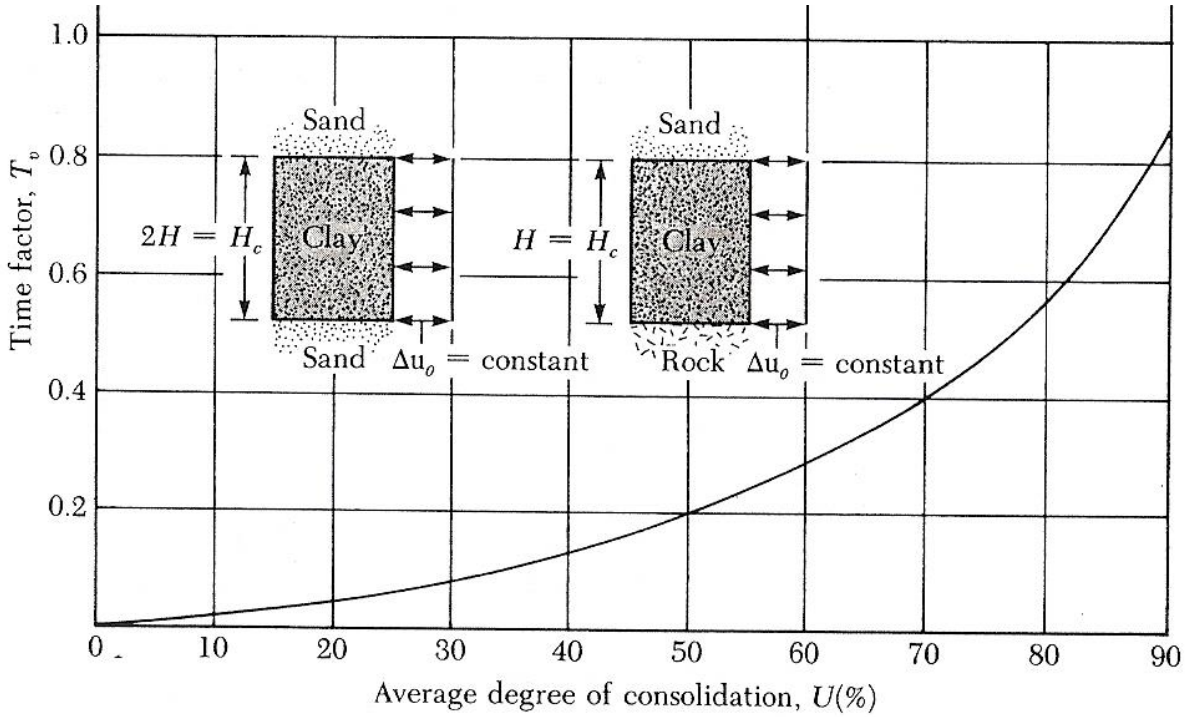
iii) The time to achieve 200 mm settlement after construction of an embankment.

[5 marks]

Depth	Type of Soil	Soil Parameter
0 m 6 m	Medium to dense SAND	γb = 1650 kg/m^3
   12 m	Sandy CLAY	γ_{sat}= 1850 kg/m^3 C_c = 0.45 e_o = 0.92 C_v = 0.52 m^2/month
  15 m	Dense SAND	γ_{sat} = 1950 kg/m^3

Figure 2

APPENDIX A



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