國立成功大學

110學年度碩士班招生考試試題

編　號：98

系　所：土木工程學系

科　目：土壤力學

日　期：0202

節　次：第 2 節

備　註：可使用計算機

※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

一、Briefly answer the following questions (簡答題) (30 pts):

1. Describe the procedure to determine the thickness of lift in field compaction. (6 pts)

2. Plot a three-phase diagram and express the moist unit weight (γ) in terms of the degree of saturation (S), the specific gravity of particle (G_s), and void ratio (e). (6 pts)

3. List the three major clay minerals and describe how to classify them from Atterberg limits. (6 pts)

4. Describe the Mohr-Coulomb failure criterion and specify the major contributions of the two authors. (6 pts)

5. Describe the principle of effective stress and the physical meaning of effective stress. (6 pts)

二、Answer the following questions of soil compaction (20 pts)

1. The results for a standard Proctor test are tabulated in Table 1. Plot the compaction curve along with the zero-air-void curve and determine the maximum unit weight and optimum moisture content. (Given Gs=2.7, volume of mold=943 cm³) (15 pts)

Table 1

Specimen	Weight of soil in the mold (N)	Water content (%)
1	14.5	8.4
2	18.46	10.2
3	20.77	12.3
4	17.88	14.6
5	16.15	16.8

2. The specifications required that the relative compaction at least 95%. Please find the acceptable range of water content. (5 pts)

三、Answer the following questions about soil shear strength. (25 pts)

1. Plot the typical shearing responses for NC and OC clay in terms of (1) deviator stress vs. axial strain, (2) volumetric strain vs. axial strain, (3) excess pore pressure vs. axial strain, and (4) Mohr circles for total and effective stress. (12 pts)

2. The results of a consolidated–undrained triaxial test on a cohesionless soil are:

    Effective consolidation stress=100 kPa; Deviator stress at failure=152 kPa;

    Excess pore pressure at failure=-62 kPa.

    (a) Determine the total and effective strength parameters of the soil. (6 pts)

    (b) Plot the effective Mohr circle at failure, mark the pole, and compute the normal and shear stresses on the failure plane. (7 pts)

四、Answer the first two questions based on the profile shown in Fig. 1. Given: $\Delta\sigma$=105kPa, H_1=2.2 m, H_2=4.4m, and H_3=7.5m. (25 pts)

Soil characteristics:
Sand: e=0.58; G_s=2.67
Clay: e=1.08; G_s=2.71; C_c=0.35;
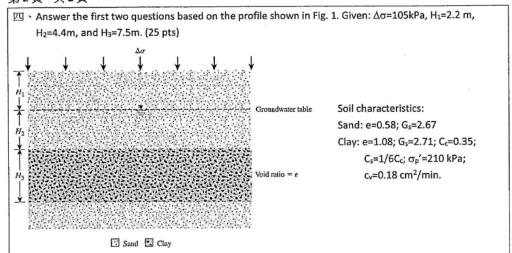　　　C_s=1/6C_c; σ_p'=210 kPa;
　　　c_v=0.18 cm²/min.

Fig. 1

1. Estimate the primary consolidation settlement in the clay layer. (10 pts)
2. How long will it take for 90% consolidation to be in the field? (T_{90}=0.848) (10 pts)
3. Describe the Casagrande logarithmic method for determining the coefficient of consolidation (c_v). (5 pts)