576 (2)

國立成功大學 76 學年度 土木研究所考試（土壤力學 試題） 共 2 頁 第 1 頁

一、（20分）

(1) 由飽和粘土單体中之体積改变率 $=(k_x\frac{\partial^2 u}{\partial x^2}+k_y\frac{\partial^2 u}{\partial y^2}+k_z\frac{\partial^2 u}{\partial z^2})\,dx\,dy\,dz$，試導下列 Terzaghi 之压密（consolidation）基本公式。

$$\frac{\partial u}{\partial t}=\left[\frac{k(1+e)}{a_v\gamma_w}\right]\frac{\partial^2 u}{\partial z^2}$$

(2) 何謂離心含水當量（Centrifuge Moisture Equivalent），並述其工程实務上之應用。

二、（30分）

(1) 於 6 m 長鋼板樁所成之擋土牆，牆後土壤為內摩擦角 32°，單位重 1.87 t/m³ 之砂質土壤，地下水位於牆頂下 2.0 m。鋼板樁頂部下 1.3 m 處，設置直徑 20 mm 之錨桿，其間隔為 1 m 時，試求鋼板樁之土中應有深度。

備註：$\sin 32^\circ = 0.53$，$\tan 32^\circ = 0.625$

$\gamma' = 1.05$ t/m³

錨桿之最大抗張强度 $= 1.2$ t/cm²

(2) 某填土工程所使用之土壤為含有通過 200 號篩 4～8 % 之粗粒土壤。試述工地压实設備之適用性，並述填土工程前後，在試驗室及工地宜作何種試驗，以提升品質。

(3) 於內摩擦角 32°，孔隙比 0.55，土粒比重 2.66 之均等質砂層，試求砂層完全浸水情況時，安全係數 $= 1.5$ 之斜面角度。

Problem 3: Housel (1929) proposed a method for obtaining the soil-bearing capacity of a footing resting on a cohesive soil for a given settlement, S. According to this procedure, the total load carried by a footing of area A and perimeter P can be given by

$$Q = Aq + Ps$$

where q = compression stress below the footing
s = unit shear stress at the perimeter

The results of two plate load tests are given in the following table.

plate diameter, D (m)	Total load, Q (KN)	settlement (mm)
0.305	32.2	20
0.610	71.8	20

A square column foundation has to be constructed to carry a total load of 815 KN. The tolerable settlement is 20 mm. Determine the size of the foundation. (10 %)

Problem 4: Peck (1969) suggested using design pressure enevelopes for braced cut in sand and clay to be shown in Figure P4.1. Now Refer to Figure P4.2. Given: γ = 17.5 KN/m^3, C = 30 KN/m^2, and center-to-center spacing of struts = 5 m. Draw the earth pressure envelope (shear force diagram) and determine the strut loads at levels A, B, and C. (20 %)

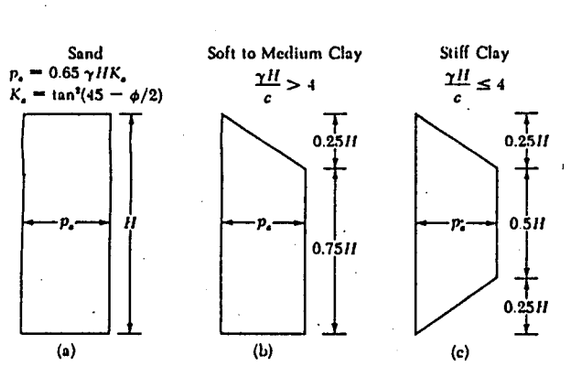

Figure P4.1 Peck's pressure envelopes for braced cuts in sand and clay [*note*: in Figure (b), $p_a = \gamma H[1 - (4c/\gamma H)]$ or about $0.3\gamma H$, whichever is higher; in Figure (c), $p_a = 0.2\gamma H$ to $0.4\gamma H$, with an average $0.3\gamma H$]

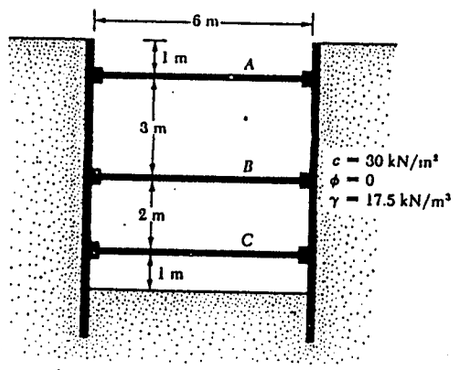

Figure P4.2

Problem 5: λ-Method was proposed by Vijayvergiya and Focht (1972), and the total frictional resistance can be given as

$$Q_a = pLf_{av} = pL\lambda(\bar{\sigma}'_v + 2C_u)$$

where $\bar{\sigma}'_v$ = mean effective vertical stress for entire embedment length

C_u = mean underained shear strength (ϕ = 0 concept)

A concrete pile 405 mm x 405 mm in cross section in Figure P5. Determine the allowable load that the pile can carry (FS = 3). Use the λ-method for determination of the skin resistance. Assume λ = 0.16 and the compressive strength of concrete pile is 210.0 Kg/cm^2,. γ_c = 10 KN/m^3. (20 %)

Figure P5