國立臺北科技大學 100 學年度碩士班招生考試

系所組別：3120 土木與防災研究所乙組

第一節　土壤力學與基礎工程　試題

注意事項：

1. 本試題共四題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

以下試題條件如不足，考生可自行作合理假設。本試題卷併同答題卷繳回

一、簡答題（36 分）

1. 土壤依重量-體積關係之固-液-氣態三相圖，分別可設定哪七項基本指數性質？至少須於實驗室求得幾項(獨立)指數方能依其三相圖之關係得到其它(相依)指數？　(6 分)
2. 說明影響夯實曲線之因素有哪些？以土壤行為之觀點說明過度夯實(over-compaction)是否適當？(6 分)
3. 分析滲流量、壓密變形量與剪力強度三項工程性質之土壤參數(常數)分別為哪些？如以這些參數做為 x-y 座標之斜率，則其各自之 x 與 y 變量又分別為哪些？(繪圖說明)(6 分)
4. 簡述擬靜態地震力如何與邊坡穩定分析作疊加考慮(繪圖說明)。(6 分)
5. 比較平鈑載重試驗(plate load test)與樁載重試驗(pile load test)之目的與方法之異同(條列說明)。(6 分)
6. 何謂"group efficiency (efficiency of the load-bearing capacity of a group pile)"? 評估計算樁基礎沉陷量有哪些項目(來源)需考慮？ (6 分)

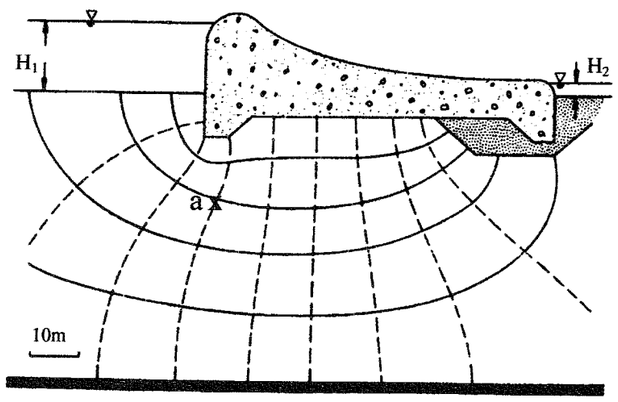
二、

A flow net for flow around a dam in a permeable soil layer is shown in Fig. 1, and H_1= 12m, H_2= 2m, $K_X = K_Z = K = 5\times10^{-3}\,cm/\sec$ are given, determine:

(a). How high (above the ground surface) will the water rise if piezometer is placed at the point **a**? (6 %)

(b). The rate of seepage through all flow channels. (7 %)

(c). Point out the location of the maximum velocity and the velocity of point **a**.　(7 %)



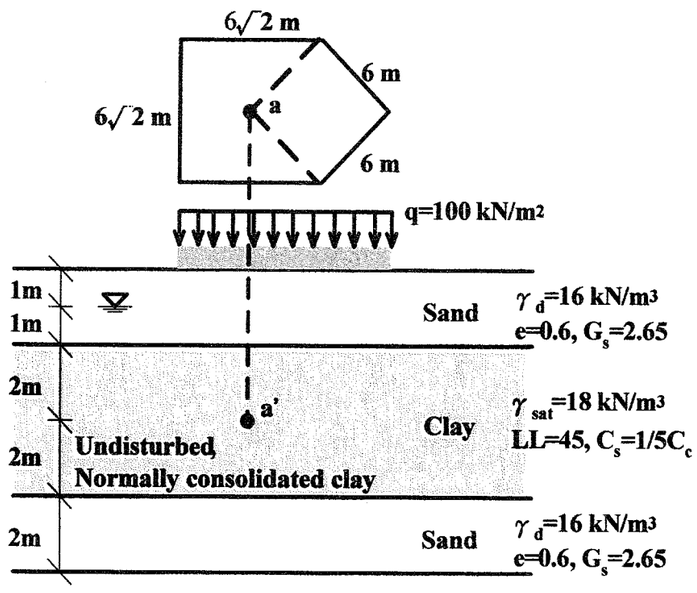
(Fig. 1)

三、A foundation shown in Fig. 2, and uniform surcharge on the ground surface q =100 kN/m^2.

(a). Calculate the stress increase, $\Delta\sigma_{a'}$, at the position a' due to q *(reference: Fig.5)*　(8 %),

(b). Calculate the primary consolidation settlement of the foundation approximately based on the answer of (a). Its preconsolidation pressure of the clay is 130 kN/m^2　(8 %);

(c). Simply assume that $\Delta\sigma_{a'}$ is a deviator stress and $\phi' = 20^\circ$. Will this clayey soil fail? If not, what is the ϕ' which can fit the failure envelope?　(8 %)



(Fig. 2)

注意：背面尚有試題

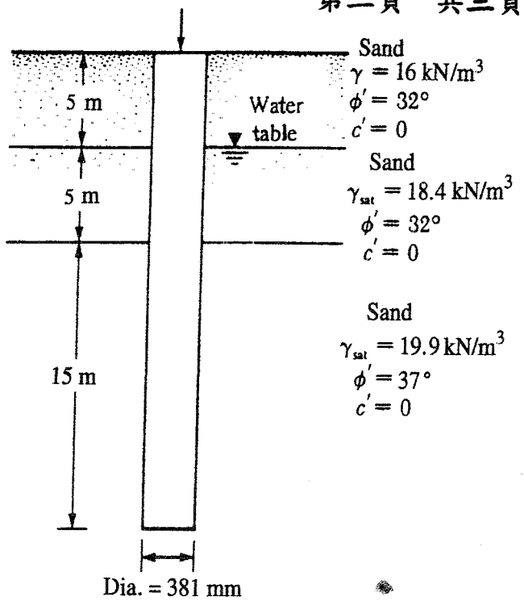
四、A driven concrete pile is shown in Fig. 3,

(a). Find the ultimate point load Q_p. (7 %)

(b). Determine the ultimate frictional resistance Q_s, given K=1.2 and $\delta=0.8\phi$. (7 %)

(c). Calculate the allowable load of a single pile using FS = 4. (6 %)

(reference: Table 1, 2, and Fig.4)

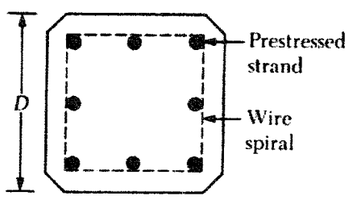


(Fig. 3)

Table 1 Typical prestressed concrete piles

Pile shape*	D (mm)	Area of cross section (cm²)	Perimeter (mm)	Number of strands: 12.7-mm diameter	Number of strands: 11.1-mm diameter	Minimum effective prestress force (kN)	Section modulus ($m^3 \times 10^{-3}$)	Design bearing capacity (kN): Concrete strength (MN/m²) 34.5	Design bearing capacity (kN): Concrete strength (MN/m²) 41.4
S	254	645	1016	4	4	312	2.737	556	778
O	254	536	838	4	4	258	1.786	462	555
S	305	929	1219	5	6	449	4.719	801	962
O	305	768	1016	4	5	369	3.097	662	795
S	356	1265	1422	6	8	610	7.489	1091	1310
O	356	1045	1168	5	7	503	4.916	901	1082
S	406	1652	1626	8	11	796	11.192	1425	1710
O	406	1368	1346	7	9	658	7.341	1180	1416
S	457	2090	1829	10	13	1010	15.928	1803	2163
O	457	1729	1524	8	11	836	10.455	1491	1790
S	508	2581	2032	12	16	1245	21.844	2226	2672
O	508	2136	1677	10	14	1032	14.355	1842	2239
S	559	3123	2235	15	20	1508	29.087	2694	3232
O	559	2587	1854	12	16	1250	19.107	2231	2678
S	610	3658	2438	18	23	1793	37.756	3155	3786
O	610	3078	2032	15	19	1486	34.794	2655	3186

*S = square section; O = octagonal section



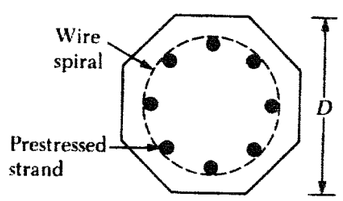


Table 2 Variation of λ with L

L (m)	λ	L (m)	λ
0	0.5	35	0.136
5	0.318	40	0.127
10	0.255	50	0.123
15	0.205	60	0.118
20	0.177	70	0.117
25	0.155	80	0.117
30	0.145	90	0.117

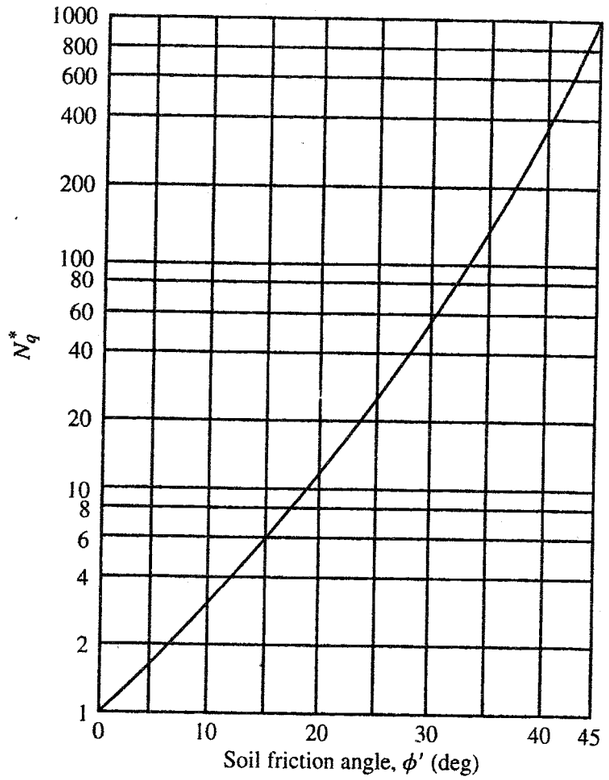


Fig. 4 Meyerhof's bearing capacity factor, N_q^*

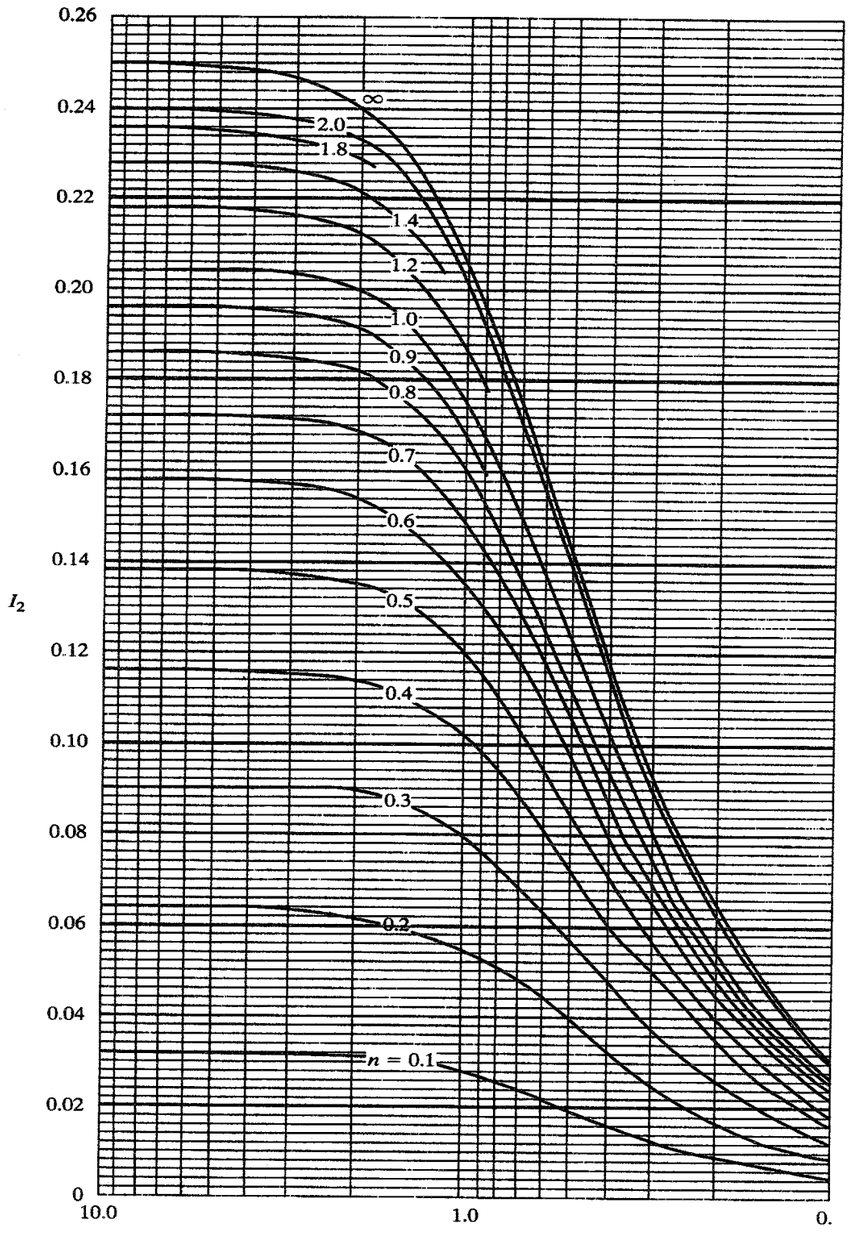


Fig. 5 Variation of I_2 with m and n