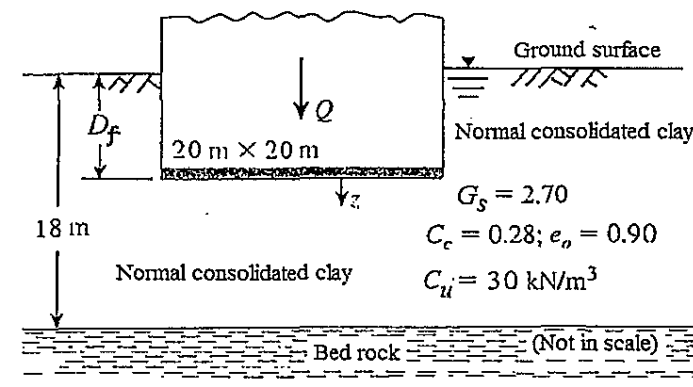


※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

- Translate following terminologies to Chinese and explain its meanings: (28%)  
 (1) counterfort wall (2) pile group efficiency (3) piping (4) the coefficient of earth pressure at rest (5) tieback (6) cone penetration test (7) fully compensated foundation design
- What is plate load test? Describe how to apply the result of the field plate load test for the engineering purpose. (12%)
- In what might be termed classical bearing capacity theory (Fellenius, Prantl, Terzaghi, etc.). What assumptions are made regarding soil properties themselves? (Write down at least 7 terms) (15%)
- What methods are used for estimating the bearing capacity of real footing on sand? Make clear what the major problems are and what is done (assumed, etc.) to resolve them (15%)
- What is the negative skin friction of pile? Describe which conditions will cause the negative skin friction of pile? How to reduce the effects of the negative skin friction of pile? (15%)
- The mat foundation shown in figure below has dimensions of 20 m x 20 m. The total dead load and live load on the raft (Q) is 40 MN. The mat is placed over a saturated clay layer with the soil property shown in the figure. (1) Determine the depth ( $D_f$ , in meters) needed for the design of a fully compensated foundation. (2) Calculate the consolidation settlement (in cm) for the fully compensated mat foundation (3) Determine the factor of safety against bearing capacity failure if  $D_f = 2.0$  m. (15%)



Reference equations:

$$q_u = c N_c F_{cs} F_{cd} F_{ci} + q N_q F_{qs} F_{qd} F_{qi} + 0.5 \gamma B N_\gamma F_{\gamma s} F_{\gamma d} F_{\gamma i} ;$$

$$F_{cs} = 1 + (B/L)(N_q / N_c), F_{cd} = 1 + 0.4(D/B), F_{ci} = F_{qi} = (1 - \beta/90)^2,$$

$$F_{qs} = 1 + (B/L)\tan\phi, F_{qd} = 1 + 2\tan\phi(1 - \sin\phi)^2(D/B), F_{\gamma s} = 1 - 0.4(B/L),$$

$$F_{\gamma d} = 1, F_{\gamma i} = (1 - \beta/\phi)^2; \text{ As } \phi = 0 \text{ degree, } N_c = 5.14, N_q = 1, N_\gamma = 0.$$