**Make reasonable assumptions if necessary.**

1、Answer the following questions briefly with texts and/or figures: (30%)

(1) Explain the causes of negative skin friction and consequences for pile systems. (6%)

(2) Describe the effective area method proposed by Meyerhof (1953). (6%)

(3) Describe the plate load test and its implementations for clayey and sandy soils respectively. (6%)

(4) Explain the free earth support method for anchored sheet-pile wall design and list the major assumptions. (6%)

(5) State the advantages and disadvantages of geophysical exploration techniques in site characterization. (6%)

2、Answer the following questions in shallow foundation analysis and design. (20%)

(1) List the factors that have been added in the general bearing capacity equation by Meyerhof (1963) but not shown in original Terzaghi's bearing capacity theory. (6%)

(2) Derive the factor of safety with Meyerhof's general bearing capacity equation for a compensated foundation subjected to vertical loads on saturated clays with $\phi$=0. (8%)

(Note: $F_{cs} = 1 + \frac{0.195B}{L}$, $F_{cd} = 1 + 0.4(D_f / B)$, where $B$ and $L$ are width and length of foundation respectively, and $D_f$ is embedded depth)

(3) List the required soil parameters for calculating foundation settlement on clayey layer and describe the functions for each parameter. (6%)

3、Answer the following questions associated with lateral earth pressures. (30%)

(1) List the assumptions for Rankine active earth pressure and derive the Rankine active earth pressure for level backfills with c=0. (10%)

(2) List the general stability requirements for cantilever retaining walls. (6%)

(3) Explain why the earth pressure distribution behind a braced cut is different from the theoretical earth pressures. (8%)

(4) Describe the required analyses for braced cut design in clay. (6%)

4、Answer the following questions related to deep foundations. (20%)

(1) Describe the conditions that require the use of pile foundations in engineering system. (6%)

(2) Explain the load transfer mechanism for a single pile. (8%)

(3) Conceptually describe the procedure for evaluating the ultimate capacity of group piles in saturated clay. (6%)