※ 考生請注意：本試題不可使用計算機

Make rational assumptions if necessary.

1、 Answer the following questions briefly with texts and/or figures: (30%)
   (1) Define SPT-N value and list 3 applications of SPT-N values in geotechnical engineering. (6%)
   (2) List all the failure modes in braced cut system. (6%)
   (3) Describe the cases suitable for using mat foundations. (6%)
   (4) Explain the advantages and principles of compensated foundations. (6%)
   (5) State the stability requirements for retaining wall design. (6%)

2、 Answer the following questions of shallow foundation analysis. (20%)
   (1) A square column foundation has to carry a gross allowable load of 2200 kN with FS=3.0. Given D_f=1.5 m, γ=15.9 kN/m^3, ϕ'=0, c_u=25 kPa. Use Terzaghi's equation to determine the size of the foundation if general shear failure occurred. (6%)
   (2) Derive the water table modification of bearing capacity equations and state the reasons during the derivation. (6%)
   (3) Derive the distribution of contact pressure under a strip footing subjected to one-way eccentric load. (8%)

3、 Answer the following questions related to lateral earth pressures. (30%)
   (1) List the factors that affect the coefficient of earth pressure at-rest (K_0) and the variations of K_0 with these factors. (6%)
   (2) Draw the Mohr circles for cohesionless soils at rest, active failure, and passive failure in a same plot and find the failure planes for the active and passive failure states. (8%)
   (3) Compare the variation of deflection and moment between the free earth support method and fixed earth support method for anchored sheet-pile walls. (6%)
   (4) Describe the procedure for evaluating the active earth pressure in granular backfill with Coulomb's active earth pressure theory. (10%)

4、 Answer the following questions related to deep foundations. (20%)
   (1) List the factors that affect the frictional resistance of piles in sand. (6%)
   (2) Describe how to apply α-method, β-method, and λ-method for skin resistance evaluation of a single pile in a **layered** clay stratum. (8%)
   (3) Explain the Davisson's method for determining the ultimate load from pile load test. (6%)