系所組別： 土木工程學系乙組

考試科目： 土壤力學

※ 考生請注意：本試題 ☑可 □不可 使用計算機

一. 將英文翻譯為中文 (每題 10 分，共 5 題)

1. (10%) In Terzaghi's bearing capacity equation, it is assumed that the bearing capacity consists in general of the sum of three components computed separately, representing respectively the contributions of :
   (1) the cohesion and friction of a weightless material carrying no surcharge.
   (2) the friction of a weightless material on addition of a surcharge on the ground surface.
   (3) the friction of a material possessing weight and carrying no surcharge.
2. (10%) One well-recognized function of the factor of safety, is to account for uncertainties and thus to guard against ignorance about the reliability of the items that enter into the analysis, such as strength parameters, porewater pressure distribution, and stratigraphy.
3. (10%) As seepage forces increases, they gradually overcome the gravitational forces acting on the soil column, and eventually a quick condition or boiling will occur. To have a sand mass in a quick condition, the effective stresses throughout the soil column must be zero.
4. (10%) Earthquake ground motions are capable of inducing large destabilizing inertial forces, of a cyclic nature, in slopes and embankments. Also the shear strength of the soil may be reduced due to cyclic strains or due to the generation of excess pore water pressure.
5. (10%) Laboratory test programs for silts to be used as fills can be conducted following the principles that have been established for testing clays. Silts are moisture-sensitive and compaction characteristics are similar to those for clays. Densities can be controlled effectively using relative degree of compaction. Undrained strengths of both plastic and nonplastic silts at the as-compacted condition are strongly influenced by water content.

(背面仍有題目,請繼續作答)

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二. A soil slope with a uniform backfill of H (slope height) = 5 m, β (slope angle) = 30°, γ (unit weight) = 18 kN/m^3, c = 10 kPa, ϕ = 30°, and a porewater pressure ratio of r_u = 0.25:

(1) Define the porewater pressure ratio, r_u. (10%)

(2) Calculate the factor of safety for the slope, F_s, using the stability charts in Fig. 1. (15%)

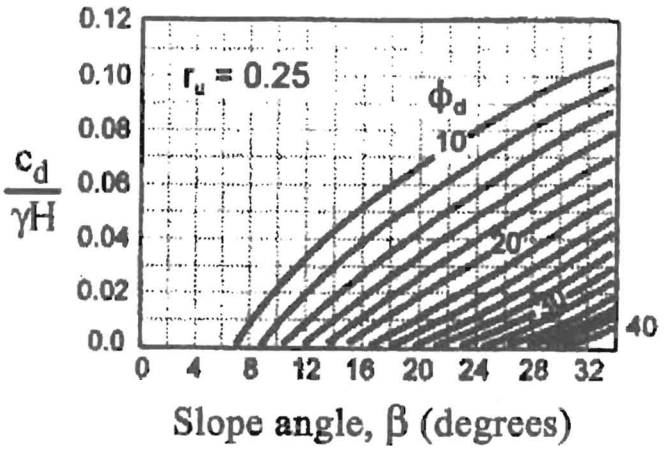

Fig. 1

三. A level ground consists of a 10 m-thick uniform clay stratum with a unit weight γ = 18 kN/m^3 and initial void ratio e_o = 0.8. Based on the result of a geological investigation, a 6 m-thick topsoil stratum has been removed from ground surface for centuries (assuming the unit weight of the removed topsoil is identical to the foundation soil). A bedrock stratum beneath the clay was also found. A 10 m × 10 m square foundation with an average load intensity q = 300 kN/m^2 is to be built at 2 m beneath the ground surface.

(1) Calculate possible total settlement of the foundation (Recompression Index, C_r = 0.1; Compression Index, C_c = 0.3) due to primary consolidation. (13%)

(2) Calculate the factor of safety against bearing capacity failure (c = 0, ϕ = 22°, N_c = 17; N_γ = 5; N_q = 7(12%)