

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)

2. Answering the question in **Part-A** is compulsory

3. Answer any **THREE** Questions from **Part-B**

PART –A

(22Marks)

- 1 a) What is the commercial name of drilling mud? What is its purpose in soil exploration? [3M]
- b) Write the formula to determine the factor of safety (as per method of slices) of a dry finite slope made of c- ϕ soil, and explain the terms in it. [4M]
- c) Write the values of Terzaghi's bearing capacity factors, when $\phi=0^\circ$. [3M]
- d) Write the formula to determine the immediate settlement of a rectangular footing and explain the terms in it. [4M]
- e) What is adhesion factor in case of pile foundations? [4M]
- f) What is the function of staining of a well foundation? [4M]

PART –B

(48 Marks)

- 2 a) Explain the terms 'inside clearance' and 'outside clearance' as applied to a sampler. Why are they provided? [6M]
- b) A plate load test was conducted in a clayey soil. What is the settlement (in mm) of a 2m x 2m footing, if the size of the plate is 30cm x 30cm and the settlement of the plate is 10mm? [4M]
- c) What are the demerits of plate load test? Explain. [6M]
- 3 a) An embankment 10m high is inclined at an angle of 36° to the horizontal. A stability analysis by the method of slices gives the following forces per running meter:
 Σ Shearing forces = 450kN
 Σ Normal forces = 900kN
 Σ Neutral forces = 216kN
 The length of the failure surface is 27m. Laboratory tests on the soil indicate c' and ϕ' as 20kN/m² and 18° respectively. Determine the factor of safety of the slope with respect to shearing strength. [4M]
- b) With a neat sketch, explain Coulomb's theory of earth pressure. [12M]
- 4 a) Discuss the various types of foundations and their selection with respect to different situations. [8M]
- b) A column carries a load of 1000 kN. The soil is a dry sand with density = 19 kN/m³ and having an angle of internal friction of 40° . A minimum factor of safety of 2.5 is required and Terzaghi factors are required to be used. ($N_\gamma = 42$ and $N_q = 21$). Find the size of a square footing required if it is placed at 1m below ground surface with water table at ground surface. Assume $\gamma_{\text{sat}} = 20\text{kN/m}^3$. [8M]

- 5 a) A footing $2.0\text{m} \times 2.0\text{m}$ is founded at a depth of 1.0m in a sand deposit, for which the corrected value of N is 25. The water table is at a depth of 2.0m from the surface. Determine the net allowable bearing pressure, if the permissible settlement is 40mm and a factor of safety of 3 is desired against shear failure. [8M]
- b) How is total settlement different from differential settlement? List the harmful effects of differential settlements. [8M]
- 6 a) Explain the procedure to estimate the pile group capacity in sands and clays. [8M]
- b) Determine the safe load of a group of nine cast-in-situ piles, 40cm diameter, 15m long, installed in a cohesive deposit. The cutoff level is 1.5m below ground level and the pile spacing is 1.2m c/c. The soil profile is 2.5m thick desiccated firm clay having undrained cohesion $= 50\text{kPa}$, followed by a 10.5m thick soft organic clay, having undrained cohesion $= 25\text{kPa}$, followed by a 16m thick stiff clay, having undrained cohesion $= 100\text{kPa}$. Factor of safety $= 2.50$. [8M]
- 7 a) Explain the procedure to decide the depth of a well foundation. [8M]
- b) A circular well of 6m external diameter and 4m internal diameter is embedded to a depth of 15m below the maximum scour level in a sandy soil deposit. The well is subjected to a horizontal force of 800kN acting at a height of 8m above the scour level. Determine the allowable total equivalent resisting force due to earth pressure, assuming the rotation is about a point above the base. Take $\gamma_{\text{sat}} = 20\text{kN/m}^3$, $\phi = 30^\circ$; factor of safety for passive resistance $= 2.0$. (Use Terzaghi's analysis). [8M]

