C 18229 (Pages : 2) Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2011

CE 04 604—GEOTECHNICAL ENGINEERING—II

(2004 admissions)

Time : Three Hours Maximum : 100 Marks

Answer all *questions.*

1. (a) Enumerate the objectives of subsurface exploration.
   (b) Write a note on immediate settlement.
   (c) Discuss about the bearing capacity of raft foundations.
   (d) Write a note on floating foundations.
   (e) How would you improve the load bearing capacity of expansive soils ?
   (f) Explain group action of piles.
   (g) Explain with a neat sketch the various forces acting on a well.
   (h) What is negative skin friction ? How it is estimated ?

($8 \times 5 = 40$ marks)

2. (a) (i) Describe SPT with a neat sketch. (7 marks)

   (ii) Calculate the net allowable bearing pressure of a square footing of size 2.5 m. founded at a depth of 3 m. from ground level. Subsoil is cohesionless with $\varphi = 35°$, $\gamma = 17$ kN/m.^{3} Water table is located at a great depth from ground level. For the given value of φ, $N_s = 57.8$, $N_q = 41.4$ and $N_\gamma = 42.4$. Factor of safety = 3. Use Terzaghi's general shear failure theory. (8 marks)

Or

   (b) (i) Discuss about the general shear failure theory proposed by Terzaghi. (9 marks)

   (ii) Explain the terms area ratio, recovery ratio and inside clearance of a soil sampler with their relevance in design. (6 marks)

3. (a) (i) Explain methods proposed by Boussinesq and Westergard to calculate stresses in soil due to load acting on the soil surface. (9 marks)

   (ii) A load of 1200 kN acts on the soil surface. Calculate the stress caused at a point 5 m. below the ground level and at a radial distance of 3 m. using both Boussinesq and Westergard theories. Find the percentage difference between the two. (6 marks)

Or

(b) (i) What is meant by contact pressure ? What is the relevance of distribution of the same in design of foundations ?

(6 marks)

(ii) A bed of sand 10 m. thick is underlain by a compressible stratum of clay 3 m. thick under which also lies a sand strata. The water table is at a depth of 4 m. below ground level. The bulk densities of sand above and below water table are 20.5 and 17.7 kN/m.^{3} respectively. The clay has a natural water content of 42 %, liquid limit 46 % and specific gravity 2.7. Assuming the clay to be normally consolidated, estimate the probable final settlement under an average excess pressure of 100 kN/m.^{2}

(9 marks)

4. (a) (i) Explain the design considerations of a strap. (7 marks)

(ii) A square footing of fails by general shear in cohesionless soil under an ultimate load of 7500 kN. The footing is placed at a depth of 2 m. below ground level. Given $\varphi = 35°$, $\gamma = 17.25$ kN/m.^{3} Determine the size of the footing if water table is at great depth.

(8 marks)

Or

(b) (i) Discuss about the uplift pressures in mats. (6 marks)

(ii) A rectangular footing is founded at a depth of 2 m. below ground level in soil having the following properties : $n = 40$ %, $G = 2.67$, $c = 15$ kN/m.^{2}, $\varphi = 30°$. The corner table is close to the ground surface. If the width of footing is 3 m. what is the length required to carry an allowable pressure of 455 kN/m.^{2} with a factor of safety of 3. $N_r = 37.2$, $N_q = 22.5$ and $N_r = 19.7$.

(9 marks)

5. (a) (i) What are drilled caissons ? Discuss the construction details. (7 marks)

(ii) A 4 × 4 square pile group is founded in a cohesive soil mass having an unconfined compressive strength of 150 kPa, 3 m. length of the pile is running through filled up soil and pile diameter is 30 cm. If the piles are placed at 90 cm. centre to centre, compute the negative friction load on the group.

(8 marks)

Or

(b) (i) Explain the term caisson disease. (5 marks)

(ii) A group of nine friction piles arranged in a square pattern is to be proportional in a deposit of medium stiff clay. Assuming the size of piles to be 30 × 30 cm.and 10 m. long, find the optimum spacing of piles. Adhesion factor is 0.8 and undrained cohesion is 50 kN/m.^{2}

(10 marks)

[4 × 15 = 60 marks]