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University Examinations 2013/2014

THIRD YEAR, FIRST SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL ENGINEERING

ECV 0242: FOUNDATION EGINEERING I

DATE: APRIL 2014   TIME: 1 ½ HOURS

INSTRUCTIONS: *Answer question* ***one*** *and any other* ***two*** *questions*

QUESTION ONE – (30 MARKS)

(a) Define the term foundation and state two assumptions made in the design of foundations.
(3 Marks)

(b) State five causes of failure in foundations.   (5 Marks)

(c) The depth to which foundations should be carried depends upon four principal factors.
State them.   (4 Marks)

(d) State five types of foundations.   (5 Marks)

(e) Give two examples of piles based on:
   (i)   Method of transfer of loads   (2 Marks)
   (ii)   Method of construction of piles   (2 Marks)

(f) State three conditions under which piles can be used.   (3 Marks)

(g) State two conditions under which mat foundations can be used.   (2 Marks)

(h) Define the following terms as used in foundations:
   (i) Shallow foundation
   (ii) Ultimate bearing capacity
   (iii)Safe bearing capacity
   (iv)Footing   (4 Marks)

QUESTION TWO – (15 MARKS)

(a) A 2.5m wide strip footing is founded at depth of 1.8m below the ground level in a homogenous bed of dense sand having the following properties

$\emptyset = 37°$ $\gamma = 1.85t/m^3$

Determine the ultimate, net ultimate, net safe and safe bearing capacity of the footing. Given for $\emptyset = 37°$

$N_c = 61$ $N_q = 43$ $N_y = 48$

Assume a factor of safety of 3.0.   (8 Marks)

(b) A column of a building, carrying a net vertical load of 150t has to be supported by a square footing. The footing is to be placed at 1.5m below the ground level in a homogeneous bed of soil having the following properties $\gamma = 1.82t/m^3, \emptyset = 30°$. Determine the minimum size of the footing, required to a factor of safety of 2.5 against failure. $N_c = 37.2$ $N_q = 22.5$ $N_y = 19.7$ (7 Marks)

QUESTION THREE – (15 MARKS)

Design a rectangular combined footing for two columns as shown below. Take allowable soil pressure as $10t/m^2$. Also draw the maximum shear force and bending moment diagrams.

(15 Marks)

QUESTION FOUR – (15 MARKS)

(a) A reinforced concrete pile of 20m overall length is driven into a deep stratum of soft clay having an unconfined compressive strength of $4t/m^2$. The diameter of the pile is 40cm. Determine the safe load that can be carried by the pile with a factor of safety of 3.0. Assume $\propto= 0.95$ (9 Marks)

(b) Calculate the ultimate bearing capacity of
     (i) A strip footing 1m wide
     (ii) A square footing $3m \times 3m$
     (iii) A circular footing 3m diameter
       Given:
        - Unit weight of soil $= 1.8t/m^3$
        - Cohesion $2t/m^2$
        - $N_c = 17.5 \quad N_q = 7.5 \quad N_y = 5$
        - The depth of all footings $= 1.5$m   (6 Marks)