B.Tech. Civil (Construction Management) / B.Tech. Civil (Water Resources Engineering)

00935

Term-End Examination

December, 2010

ET-501(B) : FOUNDATION ENGINEERING

Time : 3 hours   *Maximum Marks : 70*

Note : Attempt all questions. Use of calculator is permitted. Assume reasonable values for missing data, if any. Illustrate your answers with neat sketches.

1.   Answer any <u>FOUR</u> of the following   4x10=40

(a)   Explain in detail about plate load test for determining the bearing capacity, with neat sketches. Also discuss the effect of size of footing on bearing capacity.

(b)   Discuss the IS-Code method of calculating the bearing capacity of soil.

(c)   Compute the Safe Bearing Capacity of a continuous footing 1.8m wide, and located at a depth of 1.2m below ground level in a soil with unit weight $r = 20 \text{ kN/m}^3$, $c = 20 \text{ kN/m}^2$, $\phi = 20°$. Assume a factor of safety $= 2.5$. Terzaghis Bearing capacity factors for $\phi = 20°$ are $N_c = 17.7$, $N_q = 7.4$, $N_r = 5.0$, what is the permissible load per metre run of the footing ?

(d) A foundation 2.0m square is installed 1.2m below the surface of a uniform sandy gravel having a density of 19.2 kN/m^3, above the water table and a submerged density of 10.1 kN/m^3. The strength parameters with respect to effective stress are $c' = 0$ and $\phi' = 30°$

Find the gross ultimate bearing capacity for the following conditions

(i) Water table is well below the base of foundation.

(ii) Water table rises to the level of base of foundation.

(iii) Water table rises to the ground level

(For $\phi = 30°$, Terzaghis Bearing capacity factors $N_q = 20$ and $N_r = 20$).

(e) A clay layer, whose total settlement under a given loading is expected to be 12cm, settles 3cm at the end of one month after the application of load increment. How many months will be required to reach a settlement of 6 cm. How much settlement occur in 10 months. Assume layer as double drainage. (Given $T_v = 0.403$, 0.477, 0.567, for U=70%, 75% and 80% respectively)

(f) Differentiate between uniform and differential settlements. Indicate the tolerance limits on differential settlements in important structures. Explain some methods for controlling differential settlements.

2. Answer any <u>THREE</u> of the following :   3x10=30

(a) What are under-reamed pile foundations ?
     Under what circumstances, are they more
     efficient to other types of pile foundations.
     Explain the IS code method of determining
     the load carrying capacity of under reamed
     piles in sands and clays.

(b) Explain Culmann's method (graphical) of
     determining Active earth pressure in
     cohesionless Backfill.

(c) Write short notes on the following
     (i)   Negative skin friction
     (ii)   Combined footing
     (iii) Active and Passive Earth Pressures.
     (iv)   Damping and its types (in machine
            foundations)

(d) A 5m high retaining wall is shown in fig
     below. Find the active earth pressure
     according to Rankine's theory (i) before
     forming crack (ii) After forming crack.

(e) A pile group consists of q friction piles of
     30cm diameter and 10m long, driven into
     clay with $C_u = 100$ kN/m² and $r = 20$ kN/m³.
     Assuming factor of safety as 3.0,
     $\alpha = 0.6$, find safe load on pile group.

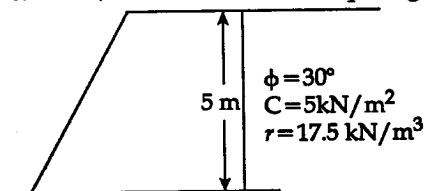$\phi = 30°$
$C = 5$kN/m²
$r = 17.5$ kN/m³
5 m

Fig. for prob 2 (d)