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

Term-End Examination

December, 2012

ET-501(B) : FOUNDATION ENGINEERING

Time : 3 hours   *Maximum Marks : 70*

Note :   *Attempt **any five** questions. **All** questions carry equal marks. Assume missing data if not given.*

1. (a)   Discuss various types of sounding methods used for site investigations.   7

    (b)   Discuss how would you decide the depth of exploration and the lateral extent of the investigations ?   7

2. (a)   Discuss modes of failure in shallow foundation.   7

    (b)   Determine the ultimate bearing capacity of a square footing of size 1.2 m if the depth of foundation is 1.0 m.   Take $\phi' = 25°$, $\gamma = 18$ kN/m^3, C = 15 kN/m^2 Dr = 90% (dense).   The water table is located well below the foundation.   Use Terzaghi's bearing capacity factors.   Assume General Shear failure.   7

    $N_c = 25.1$
    $N_q = 12.7$
    $N_\gamma = 9.7$

3. (a) Describe the general procedure for the   5
design of a shallow foundation.

   (b) A square column 410×410 mm (with 4 No.   9
   16 mm bars) carries a dead load of 1020 kN
   and an imposed load of 410 kN. The
   foundation soil has a safe bearing capacity
   of 200 kPa. Fe 415 is to be used for
   reinforcement.

   Assume concrete M_{20} grade.

   Design a square footing.

4. (a) Explain settlement and its causes.   7

   (b) A load of 3000 kN is taken by a square   7
   column footing. Side of the column is 3 m,
   footing rests on a silty soil with poisson's
   ratio $= 0.3$. Stress applied was 300 kPa.
   Strain noted is 0.6%. Assume influence
   factor for centre $= 1.12$ and at edge $= 0.56$.
   Compute settlement at centre and edge of
   the footing.

5. (a) Define earth pressure at rest. Show the   7
   earth pressure distribution on a retaining
   wall, assuming (i) the soil is dry and (ii) the
   depth of water table is at a depth of 'd' below
   the ground surface.

ET-501(B)   2

(b) From the given figure - 1 of a soil strata, **7**
compute total lateral earth pressure acting
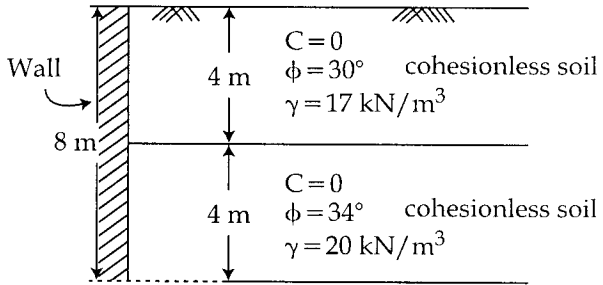on the wall and sketch distribution diagram.

Figure - 1

6. (a) Describe types of foundations with heat **7**
sketches.

(b) A concrete pile, 30 cm diameter, is driven **7**
into a medium dense sand ($\phi = 35°$,
$\gamma = 21$ kN/m^3, K = 1.0, tan $\delta = 0.70$) for a
depth of 8.0 m. Estimate the safe load,
taking a factor of safety of 2.50.

7. What are the basic dynamic soil properties ? **14**
Explain all the field methods used for determining
the dynamic soil properties.

8. Write short notes on the following : **4x3½=14**
    (a) Foundations on expansive soil
    (b) Negative skin friction
    (c) Methods of site exploration by borings
    (d) Settlement of footings on sandy soil