Registration No. :

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Seventh Semester Examination – 2013

FOUNDATION ENGINEERING

BRANCH : CIVIL

QUESTION CODE : C-196

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any five from the rest.
The figures in the right-hand margin indicate marks.

1. Answer the following questions :   2 ×10

    (a) Show the difference between active and passive earth pressure.

    (b) What is a counter fort retaining wall ?

    (c) Write Vesic's bearing capacity equation.

    (d) What is a failure wedge ? Sketch it.

    (e) When and where a pile foundation is recommended ?

    (f) Sketch a well foundation showing all its components.

    (g) What are various penetration tests useful for sub-soil exploration ?

    (h) What do you mean by N_{60} ?

    (i) What is the difference between a reverse fault and a normal fault ?

    (j) What is the difference between a Q-joint and S-joint ?

2. A gravity retaining wall is shown in Fig. 1. Calculate the factor of safety with
    respect to overturning, sliding and bearing capacity.   10

    Wall Dimensions : H = 4.6 m, x_1 = 0.25 m, x_2 = 0.45 m, x_3 = 1.6 m, x_4 = 0.4 m,
    x_5 = 0.5 m, x_6 = 0.75 m, D = 1.25 m.

Soil (Backfill) Properties : $\gamma_1 = 20 \ kN/m^3, \ c_1 = 0, \ \varnothing_1 = 30^0$

$\gamma_2 = 20 \ kN/m^3, \ c_2 = 50 \ kN/m^2, \ \varnothing_2 = 20^0$

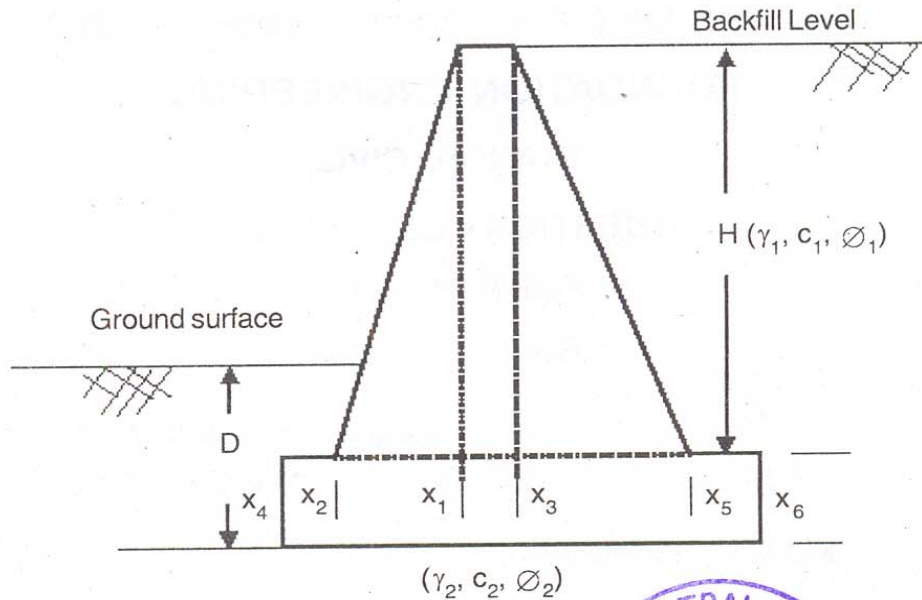Use Rankine's active pressure for calculation. Use $\gamma_{concrete} = 25 \ kN/m^3$.

Figure 1

3. (a) Derive the Rankine's analysis for determination of minimum depth of foundation in a sand deposit. If the unit weight of the sand deposit is 16 kN/m³ and the minimum depth of foundation is known to be 4 m, find the angle of internal friction of the deposit for an ultimate bearing capacity of 1200 kN/m². 5

(b) · Discuss Rebhan's Graphical solution for active earth pressure with neat sketch for the case when the ground line and the ø-line meet at a point. 5

4. (a) A square footing 3 m × 3 m is built in a homogeneous bed of sand of unit weight 21 kN/m³ and having an angle of internal shearing of 36°. The depth of the base of the footing is 1.6 m below the ground surface. Calculate the safe load that can be carried by the footing with a factor of safety of 3 against complete shear failure. Use Terzaghis' analysis. Take Terzaghi's bearing capacity factors as follows : 5

$N_c = 65.4, \ N_q = 49.4$ and $N_\gamma = 54.0$

(b) Discuss the Brinch-Hansen's analysis for bearing capacity of soil in detail. 5

5. Discuss various types of shallow foundations with neat sketches. How do you estimate the settlement of footings ? 10

6. (a) Design a friction pile group to carry a load of 3000 kN including the weight of the pile cap at a site where the soil is uniform clay to a depth of 25 meters, underlain by stable rock. Average unconfined compressive strength of the clay is 75 kN/m^2. The clay may be assumed to be of normal sensitivity and normally loaded, with liquid limit of 60%. The desired factor of safety is 2.5. 5

   (b) Discuss various options to determine the efficiency of a pile group in clay. 5

7. How would you decide the depth of boring for various civil engineering constructions? Discuss the IS guidelines. Sketch and discuss a bore hole log. What do you mean by degree of disturbance as used during sample collection ? For a standard split spoon sampler, what is its value ? 10

8. Explain the following in brief : 2×5

   (a) Effect of water table on bearing capacity

   (b) Depth of well foundation

   (c) Negative skin friction

   (d) Defects in rock mass

   (e) Recovery ratio.

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