4. (a) Explain (i) active (ii) passive (iii) at rest condition in earth pressure against a retaining wall.   **10**

    (b) A square footing located at a depth of 1.3 m below the ground has to carry a safe   **10** load of 800 kN. Find the size of the footing, if the desired factor of safety is 3. The soil has the following properties, void ratio = 0.55, Degree of saturation = 50% sp.gravity = 2.67, C = 8 kN/m^2. ϕ = 30°, N_c = 37.2, N_q = 22.5, N_r = 19.7. Use Terzaghi's analysis.

                                                                      10

5. (a) Write brief notes on :–

        (i) Standard penetration test.   (ii) Modes of shear failure.

    (b) Determine the ultimate net bearing capacity of the circular footing shown in **figure**. **10**
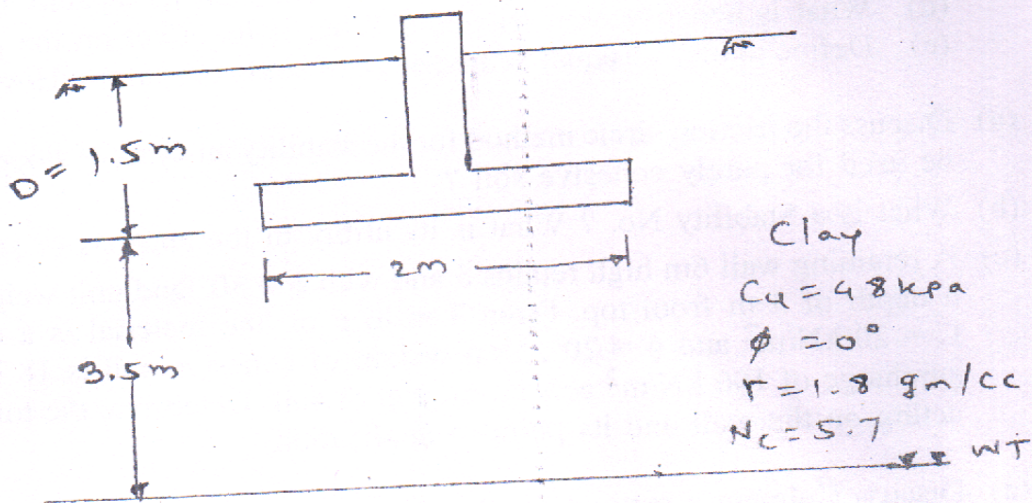
Calculate the change in ultimate net bearing capacity, if the entire region is flooded, due to which the ground water level reaches ground level.

6. (a) What are the condition where a pile foundation is more suitable than a shallow   **5** foundation ?

    (b) What do you understand by imperfect ditch condition ? What is its advantage ?   **10**

    (c) A group of 9 piles arranged in a square pattern with diameter and length of each pile **10** as 25 cm and 10 m respectively, is used as a foundation in soft clay deposit. Taking the unconfined compressive strength of clay as 120 kN/m^2 and the pile spacing as 100 cm centre to centre, find the load capacity of the group. Assume the bearing capacity factor N_c = 9 and adhesion factor = 0.75. A factor of safety of 2.5 may be considered.

                                                                      20

7. Write a short notes on (any **four**) :–

        (a) Difference in open cut and retaining walls

        (b) Reinforced soil interaction

        (c) Plate load test

        (d) Drainage of earth retaining structures

        (e) Factors influencing bearing capacity.