Time: 3 Hours   **Marks: 80**

Note 1. Question 1 is compulsory
    2. Attempt any Three out of five questions
    3. Assume any suitable data where ever required
    4. Figures to the right indicates full marks

Q.1   Attempt All the questions
   a.   Classify the Shear test based on Drainage condition   **05**
   b.   A soil mass is retained by a smooth vertical wall of 5m height. The soil has a   **05**
         bulk unit weight of 20 kN/m^3 and angle of internal friction is 160.The top of the
         soil is level with the top of wall. If the surface carries uniformly distributed load
         of 4.5 kN/m^2. Determine total passive thrust on the wall and point of application.
   c.   Explain initial, Primary and secondary consolidation   **05**
   d.   What is the method of Improving Stability of Slope.   **05**

Q.2 **a.**   A 4m square footing is located in dense sand at a depth of 2m determine safe   **05**
         bearing pressure when water table is located at base of footing Take unit weight
         of soils 18 kN/m^3, saturated unit weight 20 kN/m^3, Nc=37.2, Nq=22.5 and
         Nγ=19.7 use Terzaghi Equation
   b.   Differentiate Between Rankine's and Coulomb's earth pressure Theory   **05**
   c.   Direct shear test was conducted on sand gave a failure shear stress of 80   **10**
         kN/m^{2}when Normal stress was 170 kN/m^2, Draw Mohr's Circle and Mohr's
         Envelope and Find Principal Stresses at failure and Orientation of principal
         Planes

Q.3 **a.**   A 5.5 m high retaining wall retains soil having angle of internal friction 300,   **05**
         unit weight of 18 kN/m^3 and cohesion 6 kN/m^2. Determine the Rankine active
         pressure on the wall before the formation of crack
   b.   Explain plate load test and highlights its limitation   **05**
   c.   A Circular foundation is to be designed for total load of 675kN, if the load is   **10**
         inclined at angle of 18º to the vertical. Determine the width of foundation take
         unit weight of soils is 19 kN/m^3, angle of internal friction is 30º, cohesion 10
         kN/m^2 with FOS=3 and depth of foundation is 1.5m use Vesic equation

Q.4 **a.**   Define Compression index and Coefficient of volume change. in a consolidation   **05**
         test void ratio decreased from 0.60 to 0.50 when the load was changed from 60
         kN/m^2 to 110 kN/m^2 compute Compression index and Coefficient of Volume
         change
   b.   Differentiate between general, local and punching shear failure   **05**
   c.   A retaining wall 7m high Retains sand with angle of internal friction is 30º and   **10**
         unit weight of 24 kN/m^3 up to depth of 3.5m from top, from 3.5m to 7m the
         material is cohesive soil with cohesion is 20 kN/m^2 and angle of internal friction
         20º and unit weight of cohesive soil is 18 kN/m^3. A uniform Surcharge of 110
         kN/m^2 acts on top of soil. Determine the total active thrust on the wall and point
         of application

Q.5 **a.** Explain briefly pile load test **05**

b. A concrete pile 400mm diameter is deep in dense sand for a depth of 10m estimate safe load for the pile. Consider the following properties for the sand angle of internal friction is 30°, unit weight is 16 kN/m^3, Coefficient of friction between sand and pile is 0.7 and coefficient of earth pressure is 1. Take FOS=2.5 **05**

c A compressible layer is expected to have total settlement of 16 cm under a given loading. It settles by 4 cm at the end of two months, After the application of load increment how many months will be required to reach settlements of 8.5 cm? what will be settlements in 20 months. Assume double drainage in all case **10**

Q.6 **a.** What is the basis on which the dynamic formula is derived? Mention two well-known Dynamic formula and also explain symbol involved. **05**

b. A canal with depth of 5m has bank with slope 1:1, The properties of soil are cohesion = 20 kN/m^2, Void ratio 0.7, Specific gravity of soils 2.6 and angle of internal friction =15^0.Calculate factor of Safety with respect to cohesion When canal runs full **05**

c. A group of 16 pile arrange in a square pattern diameter of each pile is 600mm and center to center distance is 1.1m. The length of pile is 16m Estimate the safe load of the group pile as shown in figure with FOS =2.5 **10**

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