# SHANTILAL SHAH ENGINEERING COLLEGE, BHAVNAGAR
## APPLIED MECHANICS DEPARTMENT

**BE (Part Time) (PDDC) Semester 4**

**Subject Name: Soil Mechanics (2940605)**

**Assignment: 1: Slope Stability**

1. Write a short note on stability analysis of Infinite slopes for c – Φ soils.
2. What are the assumptions that are generally made in the analysis of the stability of slopes? Discuss briefly their validity.
3. Explain Swedish circle method to get factor of safety.
4. An embankment is inclined at angle 35° and its height is 15 m. The angle of shearing resistance is 15° and cohesion intercept is 200 $kN/m^2$. the unit weight of soil is 18 $kN/m^3$. If the Taylor's stability number is 0.06, find the factor of safety with respect to cohesion.

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**Assignment: 2: Stress distribution in soil**

1. Enlist assumption made in Boussinesq's theory of stress distribution.
2. Explain about vertical stress distribution, on horizontal plane and on vertical line.
3. Derive the equation of KA for Rankine's theory.
4. A concentrated load of 22.5 kN acts on a surface of a homogeneous soil mass of large extent. Find stress intensity at a depth of 15 m (i) directly under the load and (ii) at a horizontal distance of 7.5 m. Use Boussinesq's equation.
5. Calculate the vertical stress at a point P at a depth 2.5 m directly under the centre of the circular area of radius 2 m and subjected to a load 100 $kN/m^2$. Also calculate the vertical stress at point Q which is at the same depth of 2.5 m away from the centre of the loaded area.

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**Assignment: 3: Subsurface Investigation**

1. Write a note on disturbed and undisturbed sample. Discuss various types of soil samplers used for obtaining undisturbed sample.
2. Discuss standard penetration test (SPT). What are the various corrections? What is the importance of the test in geotechnical engineering?
3. Describe, in brief, various geophysical methods. Discuss their limitations and uses.
4. Describe the salient features of a good sub-soil investigation report.
5. Describe cone penetration tests. How these tests differ from standard penetration test?

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**Assignment 4: Shear Strength**

1. Explain Modified Mohr-coulomb theory.
2. Explain Direct Shear Test. What are it merits and demerits?
3. Discuss shear tests based on different drainage conditions.
4. What is unconfined compression test (UCS)? What are its advantages over a triaxial test?
5. Two identical specimen of a soil were tested in a triaxial apparatus. First specimen failed at a total stress of 770 kN/m² when the cell pressure was 200kN/m², while the second specimen failed at a total stress of 1370 kN/m² under a cell pressure of 400 kN/m². Determine the value of c and Φ for the soil. If the same soil is tested in a direct shear apparatus estimate the shear stress at which the sample will fail under a normal stress of 600 kN/$m^2$.
6. A direct shear test was performed on a 6 cm x 6 cm sample of dry sand. The normal load was 360 N. The failure occurred at a shear load of 180 N. Plot the Mohr strength envelope, and determines Angle of shearing resistance of soilϕ. Assume c = 0. Also determine the principal stresses at failure.

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**Assignment: 5: Bearing Capacity of Shallow Foundation**

1. What are different types of shallow foundations? Explain with the help of sketches.
2. Describe the general procedure for the design of a shallow foundation
3. Define the following terms: (a) Net safe bearing capacity (b) Gross safe hearing capacity (c) Allowable soil pressure.
4. What are the assumptions made in the derivation of Terzaghi's bearing capacity theory? Write the equation for the ultimate bearing capacity
5. Discuss the effect of water table on the bearing capacity of the soil.
6. What are different types of settlements which can occur in a foundation? How are these estimated?
7. Describe plate load test. What are its limitation and used?
8. A square footing is to be designed to carry a load or 500 kN. If the depth of foundation is 1.5 m, determine a suitable size of foundation with a factor of safety of 3. The water table is at foundation level. Take $\phi' = 25°$, $\gamma = 16$ kN/m$^3$, $\gamma_{sat} = 19$ kN/m$^3$. Use Terzaghi's theory. $c' = 20$ kN/m$^2$.

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**Assignment: 6: Pile foundations**

1. What are the conditions where a pile foundation is more suitable than a shallow foundation?
2. How would you estimate the load carrying capacity of a pile in (a) cohesionless soils? (b) cohesive soils
3. What is negative skin friction? What is its effect on the pile?
4. Discuss the uses of penetration tests for the estimation of load- carrying capacity of piles.
5. Discuss different methods for the installations of piles.
6. Classify the pile foundation in detail.
7. A concrete pile, 40 cm diameter, 9 m long, is driven through a 6 m thick layer of silty sand ( $\phi = 20°$, $\gamma = 17$ kN/m$^3$) overlying a dense layer of sand ( $\phi = 35°$, $\gamma = 19.5$ kN/m$^3$). If the water table is at the ground surface, estimate the safe load (F.S = 3). Take K = 1.0, and $\delta = 0.75\varphi$.

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**Assignment: 7: Introduction to Geosynthetics**

1. Write a note on different function of Geosynthetics in Civil Engineering field.
2. Explain the types of Geosynthetics and their applications.
3. Write the advantages of use of Geosynthetics in Civil Engineering project.