QUESTION BANK

DEPARTMENT: CIVIL **SEMESTER: V**

SUBJECT CODE / Name: 19CEB301 / SOIL MECHANICS

Unit 4 - SHEAR STRENGTH

PART - A (2 marks)

1. Write down the Mohr's-Coulomb failure envelope equation.
2. Why triaxial shear test is considered better than direct shear test?
3. What are different types of triaxial compression tests based on drainage conditions?
4. Explain the Mohr–Coulomb failure theory.
5. What are the advantages of direct shear test
6. What is the effect of pore pressure on shear strength of soil?
7. How will you find the shear strength of cohesionless soil?
8. List out the types of shear tests based on drainage.
9. What are shear strength parameters?
10. Write down the Coulomb's expression for shear strength.
11. How will you find the shear strength of cohesive soil?
12. What are the advantages of Triaxial Compression Test?
13. Define 'angle of repose' of soil.
14. Write the expression for coulomb's law.
15. Define shear strength and failure envelope.
16. What are the shear strength parameters?
17. Define Cohesion and stress path.
18. What is angle of internal friction?
19. What are the various methods of determination of shear strength in the laboratory?
20. Write the differential equation of deflection of a bent beam?
21. What are the disadvantages of direct shear test?
22. What are the types of triaxial test based on drainage conditions?
23. When is vane shear test adopted?
24. Sketch the Mohr's circle for total and effective stresses for undrained triaxial test.
25. Sketch the failure envelope for drained triaxial test.

PART – B (16 marks)

1. Obtain the relationship between the principal stresses in triaxial compression test using Mohr-Coulomb failure theory.

2. Two identical soil specimens were tested in a triaxial apparatus. First specimen failed at a deviator stress of 770 kN/m^2 when the cell pressure was 2000 kN/m^2. Second specimen failedat a deviator stress of 1370 kN/m^2 under a cell pressure of 400 kN/m^2. Determine the value of c and Φ analytically. If the same soil is tested in a direct shear apparatus with a normal stress of 600 kN/m^2, estimate the shear stress at failure.

3. A saturated specimen of cohesion less sand was tested in triaxial compression and the sample failed at a deviator stress of 482 kN/m^2 when the cell pressure was 100 kN/m^2 under the drainedconditions. Find the effective angle of shearing resistance of sand. What would be the deviator stress and the major principal stress at failure for another identical specimen of sand, if it is tested under cell pressure of 200 kN/m^2. Use either Mohr's circle method or analytical method.

4. Write down a step by step procedure for determination of cohesion of a given clayey soil by conducting unconfined compression test.

5. Explain with neat sketches the procedure of conducting direct shear test. Give its advantagesover other methods of finding shear strength of soil.

6. (i) Write a brief critical note on unconfined compression test.
(ii) What are the advantages and disadvantages of triaxial compression test.

7. A vane, 10 cm long and 8 cm in diameter, was pressed into soft clay at the bottom of a bore hole. Torque was applied and gradually increased to 45 N-m when failure took place. Subsequently, the vane rotated rapidly so as to completely remould the soil. The remoulded soil was sheared at a torque of 18 N-m. Calculate the cohesion of the clay in the natural and remoulded states and alsothe value of the sensitivity.

8. Describe the triaxial shear test. What are the advantages of triaxial shear test over the direct shear test?

9. Explain the Triaxial compression test to determine the shear strength of soil.

10. Explain drained behavior of clay with reference to shear strength.

11. Explain the direct shear test to determine the shear strength of soil.

12. Explain the Mohr-Coulomb failure theory.

13. Explain with neat sketch Direct Shear method of finding Shear Strength.

14. The following data were obtained in a direct shear test. Normal pressure 20 kN/m^2, Tangential pressure = 16 kN/m^2, Angle of internal friction = 20^0, Cohesion = 8 kN/m^2. Represent the databy Mohr's circle and compute the principal stresses and the direction of principal planes.

15. Compare the merits and demerits of triaxial compression test.
16. A particular soil failed under a major principal stress of 300 kN/m^2 with a corresponding minor principal stress of 100 kN/m^2. If for the same soil, the minor principal stress had been 200 kN/m^2. Determine what the major principal stress would have been if (i) $\Phi = 30^0$ and (ii) $\Phi = 0^0$.
17. A Cylindrical specimen of dry sand was tested in a triaxial test. Failure occurred under a cell pressure of 1.2 kg/cm_2 and at a deviator stress of 4.0kg/cm^2. Find
    (i) Angle of shearing resistance of the soil.
    (ii) Normal and shear stresses on the failure plane.
    (iii) The angle made by the plane with the minor principal plane.
    (iv) The maximum shear stress on any plane in the specimen at the instant of failure.
18. Explain in detail the determination of shear strength using unconfined compression test.
19. Explain in detail the determination of shear strength using vane shear test.