

**B.E. DEGREE EXAMINATIONS: NOV/DEC 2010**

Fifth Semester

**CIVIL ENGINEERING**

U07CE505: Mechanics of Soils

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 1 = 10 Marks)**

1. Maximum size of clay particle is  
a) 0.002 mm      b) 0.04 mm      c) 0.06 mm      d) 0.08 mm
2. The pycnometer is used to determine  
a) void ratio      b) water content      c) dry density      d) density index
3. The capillary rise of water  
a) depends upon the force responsible  
b) increases as the size of soil particles increases  
c) decreases as the size of soil particles increases  
d) is less in wet soil than in dry soil
4. The phreatic line in an earth dam may be  
a) parabolic      b) elliptical      c) circular      d) a straight line
5. The westergaard analysis is used for  
a) sand      b) clay      c) stratified      d) homogeneous
6. For calculating stress distribution in soils Boussinesq's assumed point load to be  
a) below G.L      b) below W.T      c) at G.L      d) at W.T
7. Shearing strength of a cohesion less soil depends upon  
a) dry density      b) void ratio      c) loading rate      d) normal stress
8. Drainage conditions during test can be controlled best in  
a) direct shear test      b) vane shear test      c) UCC      d) triaxial test
9. Stability of slopes can be increased by  
a) adopting gentle slopes      b) adopting great heights  
c) storing water on one side      d) constructing on clay deposits
10. Stability analysis shall be made considering  
a) total stresses      b) normal stresses      c) effective stresses      d) shear stresses

**PART B (10 x 2 = 20 Marks)**

11. Define porosity.
12. How do you classify a soil by the IS classification system.
13. What is Held water?
14. What do you mean by flow net?
15. What are the assumptions made in Boussinesq's theory?
16. What are the components of settlement?
17. What are the shear strength parameters?
18. Write down the Mohr-Coloumb's equation for C- $\Phi$  soil with failure envelope?
19. What do you mean by slope failure?
20. Write down the Taylor's stability number equation.

**PART C (5 x 14 = 70 Marks)**

21. a) A sample of saturated soil has a water content of 35%. The specific gravity of solids is 2.65. Determine its void ratio, porosity, saturated unit weight and dry unit weight.

**(OR)**

- b) Explain proctors compaction test.

22. a) Determine the neutral and effective stress at a depth of 16m below the ground level or the following conditions: Water table is 3m below the ground level;  $G = 2.86$ ;  $e = 0.72$ ; average water content of the soil above water table is 8%

**(OR)**

- b) A sample in a variable head permeameter is 8cm in diameter and 10 cm high. The Permeability of the sample is estimated to be  $10 \times 10^{-4}$  cm/s. If it is desired that the head in the stand pipe should fall from 24cm to 12cm in 3 min., determine the size of the standpipe which should be used.

23. a) (i) Write short notes on pressure bulb concept. (5)

- (ii) A load 1000 kN acts as a point load at the surface of a soil mass. Estimate the stress at a point 3m below and 4m away from the point of action of the load by Boussinesq's formula. Compare the value with the result from Westergaard's theory. (9)

**(OR)**

- b) A saturated the soil has a compression index of 0.25. Its void ratio at a stress of 10 kN/m<sup>2</sup> is 2.02 and its permeability is  $3.4 \times 10^{-7}$  mm/s. Compute
- (i) Change in void ratio if the stress is increased to 19 10 kN/m<sup>2</sup>;
  - (ii) Settlement in (i) if the soil stratum is 5 m thick; and
  - (iii) Time required for 40% consolidation if drainage is one-way

24. a) The following data were obtained in a direct shear test. Normal pressure = 20 kN/m<sup>2</sup>; tangential pressure = 16 kN/m<sup>2</sup>. Angle of internal friction = 20<sup>o</sup>, cohesion = 8 kN/m<sup>2</sup>. Represent the data by Mohr's circle and compute the principal stresses and the direction of the principal planes.

**(OR)**

- b) The following data relate to a triaxial compression tests performed on a soil sample:

Test No.	Chamber pressure	Max. deviator stress	Pore pressure at max deviator stress
1	80 kN/m <sup>2</sup>	175 kN/m <sup>2</sup>	45 kN/m <sup>2</sup>
2	150 kN/m <sup>2</sup>	240 kN/m <sup>2</sup>	50 kN/m <sup>2</sup>
3	210 kN/m <sup>2</sup>	300 kN/m <sup>2</sup>	60 kN/m <sup>2</sup>

25. a) Explain friction circle method of stability analysis.

**(OR)**

- b) An embankment 10m high is inclined at an angle of 36<sup>o</sup> to the horizontal. A stability analysis by the method of slices gives the following forces per running meter:

$$\Sigma \text{ Shearing forces} = 450 \text{ kN}$$

$$\Sigma \text{ Normal forces} = 900 \text{ kN}$$

$$\Sigma \text{ Neutral forces} = 216 \text{ kN}$$

Find the factor of safety against

- (i) Shear strength
- (ii) sliding

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