

Register Number:.....

**B.E. DEGREE EXAMINATIONS: NOV/DEC 2014**

(Regulation 2009)

Fifth Semester

**CIVIL ENGINEERING**

CEE114: Mechanics of Soils

**Time: Three Hours**

**Maximum Marks: 100**

**Answer ALL Questions**

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

1. A well graded sand should have  
(a)  $C_u \geq 4$                       (b)  $C_u \geq 6$                       (c)  $C_u \leq 4$                       (d)  $C_u \leq 3$
2. According to IS classification system, the soils can be classified into \_\_\_\_\_ groups.  
(a) 15                      (b) 18                      (c) 3                      (d) 7
3. The permeability of soil varies  
(a) inversely as square of grain size                      (b) as square of grain size  
(c) as grain size                      (d) inversely as void ratio
4. A flow net can be used to determine,  
(a) Seepage, coefficient of permeability and uplift pressure  
(b) Seepage, coefficient of permeability and exit gradient  
(c) Seepage, exit gradient and uplift pressure  
(d) Seepage and exit gradient only
5. The Westergaard analysis is used for,  
(a) Homogeneous soils                      (b) Cohesive soils  
(c) Sandy soils                      (d) Stratified soils
6. When consolidation of a saturated soil sample occurs, the degree of saturation  
(a) Increases                      (b) Decreases  
(c) remains constant                      (d) may increase or decrease
7. Coulomb's equation for shear strength can be represented as,  
(a)  $C = S + \sigma \tan \Phi$                       (b)  $C = S - \sigma \tan \Phi$   
(c)  $S = \sigma + C \tan \Phi$                       (d)  $S = \sigma - C \tan \Phi$

8. The angle of the failure plane with the major principal plane is given by,  
 (a)  $45^\circ + \Phi'$       (b)  $45^\circ + \Phi'/2$       (c)  $45^\circ - \Phi'/2$       (d)  $45^\circ - \Phi'$
9. The following assumptions is not made for the friction circle method of slope stability analysis:  
 (a) Friction is fully mobilized  
 (b) Total stress analysis is applicable  
 (c) The resultant is tangential to the friction circle  
 (d) The resultant passes through the centre of friction circle.
10. The factor of safety of an infinite slope in a sand deposit is 1.732. If the angle of shearing resistance is  $30^\circ$ , the safe slope is,  
 (a)  $19.45^\circ$       (b)  $75.4^\circ$       (c)  $18.4^\circ$       (d)  $71.6^\circ$

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

11. Define 'void ratio'.
12. How the fine grained soil is classified in IS classification system?
13. What is the 'effective pressure' of soil?
14. What are the assumptions made for Laplace equation?
15. What are the assumptions made for Boussinesq equations?
16. What are the factors affecting the time factor of consolidation?
17. What are the merits of shear vane test?
18. What is the 'stress path'?
19. What are the factors causing failure of slopes?
20. What do you mean by 'slope failure'?

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

21. a) The in-situ percentage voids of a sand deposit is 34 percent. For determining the density index, dried sand from the stratum was first filled loosely in a  $1000\text{cm}^3$  mould and was then vibrated to give a maximum density. The loose dry mass in the mould was 1610g and the dense dry mass at maximum compaction was found to be 1980g. Determine the density index if the specific gravity of the sand particles is 2.67.

**(OR)**

- b) Explain the various methods of compaction used in field.
22. a) The water table in a certain area is at a depth of 4m below the ground surface. To a depth of 12m, the soil consists of very fine sand having an average void ratio of 0.7.

Above the water table the sand has an average degree of saturation of 50%. Calculate the effective pressure on a horizontal plane at a depth 10m below the ground surface. What will be the increase in the effective pressure if the soil gets saturated by capillary up to a height of 1m above the water table? Assume specific gravity  $G = 2.65$ .

**(OR)**

Explain the laboratory methods for the determination of coefficient of permeability with neat sketches.

23. a) Discuss Terzaghi's theory of consolidation, stating the various assumptions and their validity.

**(OR)**

b) Two clay specimens A and B, of thickness 2cm and 3cm, have equilibrium void ratios 0.68 and 0.72 respectively under a pressure of  $200\text{kN/m}^2$ . If the equilibrium void ratios of the two soils reduced to 0.5 and 0.62 respectively, when the pressure was increased to  $400\text{kN/m}^2$ , find the ratio of the coefficient of permeability of the two specimens. The time required by the specimen A to reach 40% degree of consolidation is  $\frac{1}{4}$  of that required by specimen B for reaching 40% degree of consolidation.

24. a) Describe the Tri-axial shear test. What are the merits and demerits of Tri-axial test.

**(OR)**

b) Describe the Unconfined compression test. Write its merits and demerits.

25. a) A new canal is excavated to a depth of 5m below ground level, through a soil having the following characteristics:  $C = 14\text{kN/m}^2$ ;  $\Phi = 15^\circ$ ;  $e = 0.8$  and  $G = 2.7$ . The slope of banks is 1 in 1. Calculate the factor of safety with respect to cohesion when the canal runs full. If it is suddenly and completely emptied, what will be the factor of safety?

**(OR)**

b) Explain the various types of slope failures with neat sketches.

\*\*\*\*\*