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**Question Paper Code: 44012**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

Fourth Semester

Civil Engineering

14UCE402 - SOIL MECHANICS

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- The maximum size of grains of silt soil is about  
(a) 0.06mm      (b) 0.1mm      (c) 0.5mm      (d) 2mm
- As per IS the specific gravity of soil is determined at  
(a) 10°C      (b) 17°C      (c) 27°C      (d) 47°C
- A flow net is drawn to obtain  
(a) Seepage coefficient of permeability and uplift pressure  
(b) Coefficient of permeability, uplift pressure and exit gradient  
(c) Exit gradient, uplift pressure, seepage quantity  
(d) Exit gradient, Seepage and Coefficient of permeability
- When a soil has coefficient of permeability as 10cm/sec then the soil should be  
(a) Very fine like clay      (b) Silt      (c) Coarse like sand      (d) Gravel
- In consolidation testing, curve fitting method is used to determine  
(a) Compression index      (b) Swelling index  
(c) Coefficient of consolidation      (d) Time factor

6. Settlement due to creep in soils is contingent on
- (a) Primary consolidation                      (b) Secondary Consolidation  
(c) Initial Settlement                              (d) Compaction Settlement
7. Factor affecting pore pressure parameters is
- (a) Type of shear                                      (b) Temperature  
(c) Nature of the fluid                              (d) All of the mentioned
8. Which of the following strength test is commonly used in laboratory?
- (a) Direct shear test                                      (b) Confined compression test  
(c) Tri axial shear test                                      (d) Unconfined shear test
9. The friction circle method assumes the failure surface as
- (a) Cycloid              (b) Curve              (c) Arc of circle              (d) None of the mentioned
10. The failure of slopes may take place due to
- (a) Forces between the soil particle and High water content  
(b) Action of gravitational force  
(c) None of the mentioned  
(d) All of the mentioned

PART - B (5 x 2 = 10 Marks)

11. List out the uses of Grain size distribution curve.
12. What are the factors that influence permeability of soils?
13. Draw the consolidation curve for normally consolidated and over consolidated clay.
14. List out the demerits of Triaxial test.
15. Calculate the maximum depth of temporary vertical cut that can be made in a purely cohesive soil of unconfined compressive strength 32 kPa and unit weight  $18 \text{ kN/m}^3$ . Taylor's stability number for this case is 0.261.

PART - C (5 x 16 = 80 Marks)

16. (a) A natural soil deposit has a bulk unit weight of  $18.44 \text{ kN/m}^3$  and water content of 5 percent. Calculate the amount of water required to be added to 1 cubic metre of soil to raise the water content to 15 percent. Assume the voids ratio to remain constant. What will then be the degree of saturation? Assume  $G = 2.67$ . (16)

Or

- (b) Explain any two field compaction methods in detail with neat sketches. (16)
17. (a) A test well is installed in a permeable soil to a depth of 15m below the water table at the site and observation wells are bored at a distances of 3m and 6m from axis of test well. When pumping at the rate of  $2.3 \text{ m}^3/\text{min}$  reached a steady state, the drawdown at inner and outer wells were 1.501m and 0.50m respectively. Compute the coefficient of permeability (16)

Or

- (b) (i) Prove that effective stress in soil mass is independent of variation in water table above the ground surface. (8)
- (ii) Compute the total, effective and pore pressure at a depth of 20 m below the bottom of a lake 6 m deep. The bottom of lake consists of soft clay with a thickness of more than 20 m. The average water content of the clay is 35% and specific gravity of the soil may be assumed to be 2.65. (8)
18. (a) (i) List out the different components of settlement? Explain in detail. (8)
- (ii) In a laboratory a 2cm thick soil sample takes 25 minutes to reach 30% of consolidation. Estimate the time taken for a 5 m thick clay layer in the field to reach 40% consolidation. Assume double drainage. (8)

Or

- (b) (i) In a consolidation test void ratio decreased from 0.7 to 0.65 when the load was changed from  $50 \text{ kN/m}^2$  to  $100 \text{ kN/m}^2$ . Compute compression index and coefficient of volume change. (8)
- (ii) A Building constructed on a compressible layer settles 80mm in 4 years. Assuming that the degree of consolidation at both the times is less than 60%. Estimate the settlement in 9 years. (8)
19. (a) Write down a step by step procedure for determination of cohesion of a given clayey soil by conducting unconfined compression test. (16)

Or

- (b) A series of shear test was performed on a soil. Each test was carried out until the soil sample sheared and the principal stresses for test are as follows: Calculate shear strength parameters by Mohr circle method. (16)

$\sigma_3$ (Minor principal stress) kN/m <sup>2</sup>	300	400	500
$\sigma_1$ (Major principal stress) kN/m <sup>2</sup>	875	1160	1460

20. (a) Write down the procedure for determining the factor of safety of a given slope by friction circle method. (16)

Or

- (b) An embankment is inclined at an angle of 35° and its height is 25 m. The angle of shearing resistance is 18° and the cohesion intercept is 180 kN/m<sup>2</sup>. The unit weight of soil is 20 kN/m<sup>3</sup>. If Taylor's stability number is 0.06, Calculate factor of safety with respect to cohesion. (16)