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Paper Code - U228-115 (ESE)

**MAY 2019/ENDSEM**

**S. Y. B. TECH. (CIVIL) (SEMESTER - II)**

**COURSE NAME: Geotechnical Engineering**

**COURSE CODE: CVUA22175**

**(PATTERN 2017)**

Time: [2 Hours]

[Max. Marks: 50]

**(\*) Instructions to candidates:**

- 1) Answer Q.1, Q.2, Q.3, Q.4, Q.5 OR Q.6, Q.7 OR Q.8
- 2) Figures to the right indicate full marks.
- 3) Use of scientific calculator is allowed
- 4) Use suitable data where ever required

Q.1) a) Define the terms: water content, void ratio, degree of saturation, [6]  
specific gravity and state different methods to find water content  
of a given soil.

**OR**

b) Draw a neat sketch of plasticity chart as given by IS and classify [6]  
the soil with liquid limit = 75% and plastic limit=42% according  
to the chart.

Q.2) a) State Darcy's law, define coefficient of permeability and derive [6]  
equation for coefficient of permeability used in constant head  
method.

**OR**

b) With a neat sketch explain "quick sand condition" and derive [6]  
expression for critical hydraulic gradient.

Q.3) a) Distinguish between Boussinesq's theory and Westergaard [6]  
Theory of stress distribution.

**OR**

b) A partially saturated soil from an earth fill has natural water [6]  
content Of 19% and bulk unit weight of 19.33 kN/m<sup>3.0</sup>.  
Assuming  $G = 2.6$ , determine the degree of saturation, void ratio  
and porosity.

Q.4) a) Which shear test is suitable for saturated clayey soil? Write down [4]  
the formula and meaning of all terms.

**OR**

b) Determine shear strength in terms of effective stress on a plane [4]  
within a saturated soil mass at a point where the total normal  
stress is 200 kN/m<sup>2</sup> and pore water pressure is 80 kN/m<sup>2</sup>. The  
effective stress shear strength parameters for the soil are  $c' = 16$   
kN/m<sup>2</sup> and  $\phi' = 39^\circ$ .

- Q.5) a) Explain Rehmann's graphical method for evaluation of earth pressure. [6]  
b) Explain Active, Passive Earth pressure with respect to wall movements with sketches. [4]  
c) Find the critical height of excavation of a vertical cut in a cohesive soil if  $c = 30 \text{ kN/m}^2$  &  $\gamma = 18 \text{ kN/m}^3$ . [4]

OR

- Q.6) a) Compute the active earth pressure at a depth of 4 m in sand whose angle of friction is  $35^\circ$  and density is  $15.1 \text{ kN/m}^3$  in dry state. Also compute the active earth pressure if the water table rises to the ground level. Assume saturated unit wt. of soil  $22 \text{ kN/m}^3$ . [6]  
b) State assumption in Rankine's earth pressure theory. [4]  
c) A wall 6 m high has a smooth vertical back and it retains a non-cohesive level back fill with  $\gamma = 18 \text{ kN/m}^3$ ,  $\phi = 30^\circ$ . Determine the total lateral earth pressure in active state. [4]

- Q.7) a) Explain with sketch the different types of failures of slopes. [6]  
b) State any four ground improvement techniques. Explain any one in detail. [4]  
c) State any four types of soil reinforcement. Explain any one in detail. [4]

OR

- Q.8) a) What is infinite slope and finite slope? Give examples. [6]  
b) State four causes of slope failure. [4]  
c) What is soil stabilization? What are the different methods of soil stabilization? [4]