

Roll No. ....

Total Pages : 03

**BT-4/M-20**  
**SOIL MECHANICS**  
**CE-208-E**

**34021**

Time : Three Hours]

[Maximum Marks : 100

**Note** Attempt Five questions in all, selecting at least one question from each Unit. All questions carry equal marks. Assume missing data, if any, suitably.

**Unit I**

**1.** Discuss briefly :

- (a) Atterberg limits and their physical significance **12**  
(b) Darcy's law and its validity. **8**

**2.** (a) What are fine grained soils ? Describe as to how are these soils classified as per I.S. Draw a sketch of I.S. plasticity chart to explain. **12**

- (b) A wet soil weighs 1.88 g, if the specific gravity of soil solids is 2.72 and water content is 10%, determine dry density, void ratio and degree of saturation. **8**

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## Unit II

3. (a) Discuss capillary rise phenomena in soils. By giving an example explain as to how the effective stress is calculated in the zone of capillary rise. **10**
- (b) What is Piping ? Discuss briefly. **10**
4. (a) Discuss the role of moisture content and compactive effort in compaction of soils. Draw a sketch to explain. **10**
- (b) How are cohesionless soils compacted in field? Discuss briefly. **10**

## Unit III

5. (a) How is stress distribution carried out under loaded areas as per approximate method ? Describe. **10**
- (b) Compare Boussinesq's equation and Westergaard's analysis for vertical stress distribution. Also discuss the assumptions for both cases. **10**
6. (a) Draw typical void ratio-pressure relationships for sands and clays. **10**
- (b) What do you understand by N.C. and O.C. clays ? **10**

## Unit IV

7. (a) Derive a relationship between principal stresses at failure for a soil, in terms of shear strength parameters  $C$  and  $\phi$ . **10**
- (b) In a direct shear test on clean sand, the failure occurred under the following stress conditions  
Normal stress =  $1.85 \text{ kg/cm}^2$  and shear stress =  $1.0 \text{ kg/cm}^2$ . Draw the Mohr circle of stress at failure condition and determine (a) shear strength parameter (b) the magnitude and direction of principal stresses at failure. **10**
8. (a) A wall with smooth vertical back 8 m high supports a purely cohesive soil ( $\phi = 0$ ) with  $C = 0.4 \text{ kg/cm}^2$  and bulk density =  $1.36 \text{ g/cm}^3$ . Draw Rankine's E.P. diagram and position of zero pressure. **10**
- (b) Discuss briefly Coulomb's earth pressure theory. **10**